Report of the
11th International Biology Olympiad
in Antalya Turkey

Report of the

11th International Biology Olympiad

in Antalya Turkey

July 09-16, 2000

Edited by

Dr. Ali Demirsoy & Dr. Aşkın Tümer

Acknowledgements

We wish to express our sincere gratitudes to:
TÜBİTAK
The Republic of Turkey Ministry of Culture
The members of the Scientific Committee and all the other contributors
The Guides
The staff of Tubitak's Printing Office
Turkish Radio and Television Council (TRT)

And very special thanks to Olga Poluljach and Alex Friedmann for their help in translations

Contents

1. Foreword

1.1. History

Involvement of Turkey in this scientific event started when Professor Ali Demirsoy attended the 3rd IBO in Utrecht in 1992 as an observer and recommended that Turkey should be in.

Then, four years ago, at an IBO meeting, Tomas Soukup asked us if Turkey would like to host one of the future IBOs. When we replied "Yes, we would like to, but first we must get an approval from our government", we did not have the slightest idea about what a difficult work was awaiting us. After obtaining the necessary approval, at the next year's coordinators meeting, we declared our candidacy for the 11th IBO in 2000. But we still did not have a clear thought about how huge and complicated was the work we had to cope with. However, the first signs of anxiety and excitement had already started to show up. We were wondering if we would contrive to manage this highly complicated and multiaspected work. Now that the work is inevitable and there was no way to escape, the only remaining possibility was to get started with it. First, we established a small organizing committee comprising Prof. Demirsoy, Prof. Turner and Mrs. Sema Budak of TUBITAK (Turkish Scientific and Technical Research Council). At the end of 1998 we prepared a master plan in which we put down all the items to be done with all the details.
We divided the whole work into 3 groups. The first one was covering all the work dealing with communications and printing, the second one was preparation of the practical and theoretical questions and the third group was accommodations, transfers and all the other social activities. TUBITAK was going to be the main sponsor and supporter of the 11th IBO.

Communications and printed materials

All the communications were conducted from TUBITAK. Also the printing facilities of TUBITAK were used for designing, typing and printing of the necessary materials. Whatever we did, we paid the highest attention to sticking to the IBO rules.

In November 1999, we started dispatching official invitation letters to the participating countries. Then a Preparation Report and certain forms which had to be filled in and returned to us were mailed to each participating country. In all communications we strictly followed the schedule given in the rules book. During the communications we were mostly afflicted by the difficulties caused by some countries. We would like to thank those countries which acted sensitively in responding us. However, some countries did not feel to urge in doing so. We even realized that some countries were attending, only when we met them at the airport.

We prepared a web site in order to supply our colleagues with as much information as we could. There was an on-line registration page in our web site but very few countries used it.

We also prepared some printed materials. We prepared a colour brochure in which we put some photos and information about Antalya and its surroundings as well as general information about the 11th IBO.

Preparation of the tasks and the questions

For the preparation of the tasks and the questions of the 11th IBO, a scientific committee was established in the middle of 1999. The committee consisted of lecturers mainly from the Biology Department of Hacettepe University (Ankara). Professors from Gazi University (Ankara) and Ege University (Izmir) also contributed. Then we constructed subcommittees to prepare each section of the practical tasks and theoretical questions. These subcommittees kept meeting at certain intervals. Towards the end of 1999, when the practical tasks became clear, we started purchasing the necessary material and building up the experimental set-ups. By the end of April 2000, all experimental set-ups were ready. Meanwhile theoretical questions were being prepared. We were gathering freqently and working on the so far prepared questions. The most important concern of us was the difficulty level of the questions. We paid attention to prepare multiple choice questions that would distinguish between knowledge and guessing. In conjunction with this, we decided to suggest a method to be applied for the first time in this olympiad which was the deduction of the sum of the points of the wrong answers from that of the correct ones. Here, we would like to thank our colleagues who sent us questions some of which we used in the tests.

The questions were initially prepared in Turkish and then translated into English. Unfortunately, it took longer than anticipated to make the final versions of the questions ready. Therefore, we couldn't be able to spend enough time on correcting the mistakes in the English version which caused some grammar mistakes to be left. We must admit that the most frustrating and exhausting work was to have the questions translated from English into Russian. Most of this work was done in TUBITAK, Ankara. Later, one week prior to the olympiad, we hosted Mrs. Olga Poluljach in Antalya and had her control the Russian version or make new translations when necessary. Dear Olga contrived this long and devestating work with great success. Once again many thanks to her.

Here, we must regretfully point out that the unusual fastidiousness shown to our experiments and to some theoretical questions by some delegations, and the deletion of some questions without even been carefully examined, upset us a little bit.

Accommodations, transfers and other social activities

At the beginning, we had planned to organize the olympiad at the Mediterranean University in downtown Antalya but later we changed our minds in order to provide our guests with a possibilty of having a short but nice holiday during which they could enjoy the sun and the sea. Therefore, we decided to move the olympiad to the Belek region where there were lots of resorts that would fit our expectations. First, a technical committee made a search at the site and submitted a report. We preferred to leave the job to the hands of professionals and decided to hire a travel agency for all the activities such as hotel room reservations, airport transfers, excursions and other social activities.

We asked the travel agency to find hotels and arrange everything according to this report. We frequently gathered with the agency people and eleborated on everything that should be done. By March 2000, all the preliminary preparations were completed. As soon as we knew the number and arrival details of the participants we imparted this information to the agency and they took care of the rest.

The cost of providing a holiday opportunity along with the intensive work of the olympiad was to transport all the necessary material to the resort site. This was another thing that concerned us much. Among the material to be transported there were fragile glassware as well as highly delicate biological material such as insect and plant preparations. Devastation of these material during the transport would have endangered the fate of the whole event. But we took the risk and fortunately nothing bad happened. All the experimental set-ups were in their places one week prior to the olympiad.

And finally, The Olympiad...

When our first guests appeared at Antalya International airport, we were all ready with a slight excitement in our hearts, awaiting the olympiad to begin. We were extremely exhilarated by seeing our colleagues in Antalya. Wishing that everything goes in route and for a successful week, on the morning of July 9 we took our places in the opening ceremony.

You all know the rest. We hope that you left Antalya with good expressions and memories. In a place which was quite distant from the nearest educational facility and had been established mainly for touristic purposes, we might have had some mistakes due to some anticipated or unanticipated reasons. Hoping that in such a complicated and huge organization these mistakes are tolerated by all of you, we would like to express our best regards.

Dr. Ali Demirsoy

Dr. Aşkın Tümer

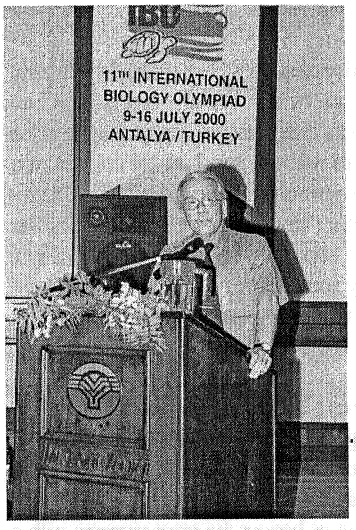
1.2. Addresses

1.2.1. The President of Tubitak

Prof. Dr. Namık Kemal PAK

Greetings,

I would like to welcome you all, on behalf of my country and TÜBİTAK, to Anatolia, the gateway to three continents, a cradle for great civilisations and a continent in its own right with its vast biological wealth. I would like to start by thanking to all the delegations for the decision to hold the 11th International Biology Olympiad in Turkey at the start of a new millennium.



Prof. Pak, giving his speech

On your faces, I can see the shine of a very well-deserved pride. The worldwide cooperation of biologists recently yielded one of the most spectacular accomplishments of the mankind: the completed draft of the human genome, "our book of life." The sequencing of over three billion base pairs give us prospects whose range and scope almost defy comprehension. I am not going to list the promised benefits which you all know. However, I can't help but voice a worry which has come to accompany the jubilation: whether the gained insight into our genes and the ensuing ability to manipulate them can serve to deepen the existing divisions and inequalities instead of bridging them. Best way to address these worries is to forge a deeper cooperation between the researchers and make sure that both the science and is application is shared equitably as befits our "species." On your faces, I also see that will and determination to keep the fruits of research as the common property of humanity; the will to share the ultimate results of your competition to carry science to further victories.

But we do not see the contest here as merely an instrument to motivate the youth for greater strides in biology, a science which looms in scope and content in the coming years; we also regard it as an international event with a far more important mission: one that strengthens the

foundations of friendship and fraternity, one that speeds up the collusion of peoples and cultures. No matter what the results turn out to be, do not forget that the true gain will be impressions you gather here, the friendships you forge and the excitement of getting to know a different part of the world.
Throughout your stay here, we shall try to acquaint you with the historical and natural riches of our country, to show you the important role Anatolia has played in the history of mankind. While putting to test your ever-widening knowledge of biology, you will have a chance to descend to the depths of the historical treasures around you in your leisure time.

This is an area where ancient kingdoms of Lykia, Lydia and Pamphylia have predated Greek and Roman civilizations. Some of the relics still stand in awe-inspiring grandeur, such as the rock-hewn tombs and the elevated burial shrines of ancient Xanthos.

It is clear, then, that you are in a place where fate and ancient gods have molded the lives of its inhabitants, where fortune and misfortune existed side by side. We have brought you here so that while putting to test your knowledge, you may also wash away your fatigue in the clear blue waters of the Mediterranean, and bask in its warming sun. Last but not least, you will see a cross-section of the traditions and folklore representing the rich variety of cultures that make up Turkey and sample its culinary delights. I have no doubt that some possible inconveniences and snags will be forgiven. But we hope that everything goes the way it should for such an important event and its worthy participants, so that while you return home with a bagful of favourable impressions, we may enjoy the contentment of having been good hosts.

I wish you, the biologists of future, a successful contest, in firmest confidence that the 11th International Biology Olympiad will serve to strengthen international ties of fraternity and friendship. I hereby express my gratitude for colleagues who have helped organise this event and to the members of delegations for the intellectual effort and sweat they have put in. This land has witnessed the first florishing of science. Let us honour the great pioneers with a befitting contest.

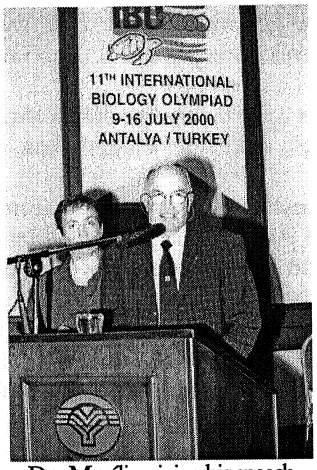
Thank you all.

1.2.2. The Chairman of the IBO Coordinators
Drs. Hans Morélis

Dear participants, colleagues, organizers and distinguished guests

We remember the first IBO, which took place ten years ago in 1990.

In that year students of six countries were assembled together for an event which over the years has proven to be very stimulating for gifted students and important in the field of education in biology.



Drs. Morélis, giving his speech

Teamleaders present in 1991 will remember the blisters on Those present during the first IBO probably will remember the very interesting practical task involving the comparison of the development of plants grown in dimmed light in a shelter and in the open air. And until now it is the one and only olympiad in which video was incorporated in the practical task.their fingers due to the absence of copying machines in that time and so all the tasks for every student were written by hand.

The 3rd IBO was very special. Turkey was participating for the first time and copying machines were available, a very lucky coincidence.

Prof Demirsoy and Tumer proved to be professional and reliable Turkish colleagues and their efforts over the years for the IBO now are culminating in this 11th IBO in Antalya with teams from 38 countries, again more than ever before.

A special welcome applies for the newcomers: competitors of India and Indonesia.

Ladies and gentlemen, we like to draw your attention to the aims of the olympiad which are indicated in our Guide and Rules. And we like to mention two of them:

- establish friendly relations among young people from different countries and so stimulating co-operation and friendship between nations, and
-
- stimulating active interest in biology, a wonderful and important science to study and the basis for all life sciences.

We know that for some students a third aim of being here is their motive: winning a medal.

We like to make a remark on this: if you came here with the sole purpose to win a medal our warning is: be prepared to make friends,

but .... if you came here with the idea to make friends we think you deserve a medal as you really understand the olympic spirit.

Anyhow, it is obvious that many of you made great efforts to come here in Antalya and we hope that this olympiad will fulfil your expectations and that everybody will find the right balance between friendship and success.
We are with great expectations for the tasks, especially for the practical tasks which are looking promising with subjects like Ecology and Gel-electrophoresis.
I'm sure that many of you will perform better than the last time I was involved in this experiment.

My neighbour while handling the syringe with alkaline buffer solution spoiled some drops on my brand new trouser, which produced a nice but firm purple spot damaging this dress. So a hint for the practical task could be: handle syringes with care.

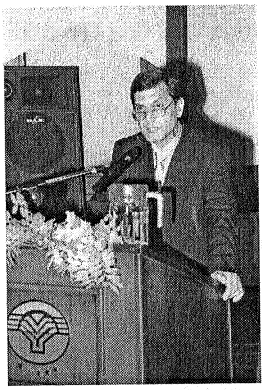
To be more serious: we now are at the start of a week which without any doubt will become an unforgettable experience.

It is a great pleasure for all of us to have the opportunity to attend this 11th IBO in Turkey, a country famous for its rich culture.
(Biz şu an, şüphesiz herkes icin cok gűzel bir deneyim olacak bir haftanin başında bulunuyoruz.
Fakat, özellikle onbirinci olimpiyada böyle eşşiz bir űlkede katlmak bizim icin cok hoş.
Zengin kűltűrű ile űnlű bir űlke: Turkiye!)

1.2.3. The Chairman of the Organizing Committee
Dr. Aşkın Tümer

Dear Colleagues, Dear Guests and Dear Competitors;

On behalf of the Organizing Committee, it is my great pleasure to welcome you all to the Opening Ceremony of the 11th International Biology Olympiad.



Prof. Tümer, giving his speech

I should say that we have come along way. We did and will do our best to make this one a successful and a pleasant organization. You are now in the mediterranean region of Turkey. You will be surrounded by a warm atmosphere by all means during your stay here. You will be dealing with tough jury sessions, translations, discussions, practical and theoretical tests. But you will also have a chance to taste the beauty of Antalya and her surroundings. You will see examples of Turkish culture and you will visit some places where natural beauties and history meet.

Dear Competitors,

We all know that this is an international competition. Naturally your aim is to be successful and win medals. But please do not miss the chance of enjoying it and developing new and may be everlasting friendships with your counterparts from the other countries. During your stay here you will be taken care of by your lovely guides. Their and our only wish is to make this week an unforgetable one for you. Please do not hesitate to ask for their help whenever you needed.

Once again, I would like to say to all of you welcome to Antalya and good luck. Thank you.

2. Organization

2.1. Organizing Committee

At the end of 1998, an organizing committee consisting of Prof. Ali Demirsoy, Prof. Aşkın Tümer and Mrs. Sema Budak was established. The main purpose of this committee was to prepare a master plan with all details of the organization and find right people to do the right works. The master plan was ready in early 1999. The core of the scientific works was decided to be the Biology Department of Hacettepe University. Contribution s were also welcome from the Biology Departments of Ege University (İzmir) and Gazi University (Ankara).

2.2. Scientific Task Committees

The responsiblity of the local scientific committee was preparation and selection of the theoretical questions as well as to determine the topics of the practical tests and to plan them. The committee first came together in Februrary 1999 and developed subcommittees according to the contents of the theoretical test given in the IBO Rules Book. The members of these committees and their subjects are given below:

Cell Biology Group
Prof. Ay Öğüş- Hacettepe University, Department of Biology
Assoc. Prof. Nuran DİRİL- Hacettepe University, Department of Biology
Assoc. Prof. Şayeste Demirezen- Hacettepe University, Department of Biology

Genetics and Evolution Group
Prof. Mustafa KURU- Gazi University, Department of Biology
Prof. Ali DEMİRSOY - Hacettepe University, Department of Biology
Prof. Ertunç GÜNDÜZ - Hacettepe University, Department of Biology

Plant Anatomy and Physiology Group
Prof. İsmail TÜRKAN- Ege University, Department of Biology,
Assoc. Prof. Emel OYBAK - Hacettepe University, Department of Biology
Hasim ŞAĞBAN- Hacettepe University, Department of Biology

Animal Anatomy and Physiology Group
Prof. M. Turan AKAY- Hacettepe University, Department of Biology
Yusuf DURMUŞ- Hacettepe University, Department of Biology
Dr. Nuray AKBULUT- Hacettepe University, Department of Biology
Dr. Aydın AKBULUT- Hacettepe University, Department of Biology

Behaviour Group
Assoc. Prof. Zafer AYAŞ- Hacettepe University, Department of Biology
Murat AYTEKİN- Hacettepe University, Department of Biology,

Ecology Group
Assoc. Prof. Nurdan ÖZER - Hacettepe University, Department of Biology
Assoc. Prof. Selim S. ÇAĞLAR- Hacettepe University, Department of Biology
Assoc. Prof. Bülent ALTEN- Hacettepe University, Department of Biology

Practical tests were all planned and designed by the academic staff of the Biology Department of Hacettepe University. Some people who are already in the subcommittees for the preparation of the theoretical guestions, also supervised and contributed the preparation of the practical tests. Academic staff who were involved in the preparation of the practical tests are given below.

Practical Test I (Botany)
Burcu Bursalı
Nuran Çiçek
Öykü Mumcu

Practical Test I II (Biochemistry)
Ceren Acar
Esra Birden
Selma Gülbitti
Emine Öksüzoğlu
Hatice Mergen

Practical Test I I (Zoology)
Güldeniz Özmen
Arzu Koçkaya
Hasan Sevgili

Practical Test I V (Ecology)
Sinan Kaynaş
Şahin Toprak
Nihan Yazgan

The local scientific committee

2.3. Student Guides

The guides were selected among university students. Majorty was from the Biology Department and Medical School of Hacettepe University. The others were the students of the Middle East Technical University. Competitors from 38 countries were guided by the following guides during the whole event:

Mr. Afig Hasanov (Ukraine)
Ms. Ahu Soylu (Latvia)
Ms. Anıl Soyumert (China)
Mr. Aras Erekul (Finland)
Mr. Arın Doğan (Vietnam)
Ms. Aslı Demir (Azerbaijan)
Ms. Aysun Kılıç (Bulgaria)
Ms. Ayşe Gümrükçüoğlu
Ms. Ayşe N. Şeniz (Switzerland)
Ms. Ayşin Akıncı (Kazakhstan)
Mr. Başar Cenik (Sweden)
Ms. Ceyda Sönmez (Thailand)
Ms. Çiğdem Tosun (Mexico)
Ms. Dane Rusçuklu (Moldova)
Ms. Deniz Candaş (Ireland)
Ms. Dilara Karadeniz (Belgium)
Ms. Meltem Bilikmen (Kyrgystan)
Ms. Ece Garipoğlu (Indonesia)
Mr. Erçin Ural (United Kingdom)
Mr. Fatih Dikmen (Uzbekistan)
Mr. Fatih Kanal (Romania)
Ms. Fatma Kaynak (Czech Republic)
Ms. Hilal Şakrucu (Korea)
Mr. İsmail Sağlam (Avustralia)
Mr. Kadir Yiğitus (India)
Mr. Kahraman İpekdal (Islamic Republic of Iran)
Mr. Mert Akdan (Argentina)
Ms. Müge Daştan (Germany)
Ms. Naranjargal Suhragçaa (Mongolia)
Ms. Nilay Bayram (Slovak Republic)
Ms. Pınar Yurdakul (The Netherlands)
Mr. Ramin Süleymanov (Russian Federation)

Ms. Reyhan Türker (Poland)
Ms. Serna Uygun (Turkmenistan)
Ms. Maria Elkotob (Estonia)
Ms. Tuğba Öztürk (Turkey)
Mr. Yılmaz Dadük (Kuwait)
Ms. Zeynep G. Şenyurt (Taiwan)

Guides, after a rehearsal

3. Program

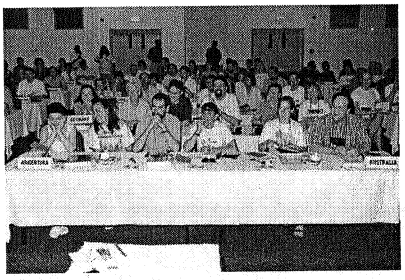
The daily program of the 11th IBO was as follows:

Sunday 09 July 2000 - Arrival Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
Ongoing	Arrival and welcome desk at Antalya International Airport Transfer to Adora Golf Resort Hotel	Ongoing	Arrival and welcome desk at Antalya International Airport Transfer to Altis Golf Hotel
07:30	Breakfast	07:30	Breakfast
	Free time		Free time
13:00	Lunch	13:00	Lunch
	Free time		Free time
19:00	Dinner	19:00	Dinner
	Free time		Free time

Monday 10 July 2000 - Opening Ceremony Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
07:30	Breakfast	07:30	Breakfast
11:00	Opening Ceremony (Hotel Sun Zeynep)	11:00	Opening Ceremony (Hotel Sun Zeynep)
13:00	Lunch	13:00	Lunch
	Free time	14:00	1st Jury Session:approval and translation of practical test
19:00	Dinner	19:00	Dinner
	Free time	20:00	1st Jury Session (continued)



The International Jury at work

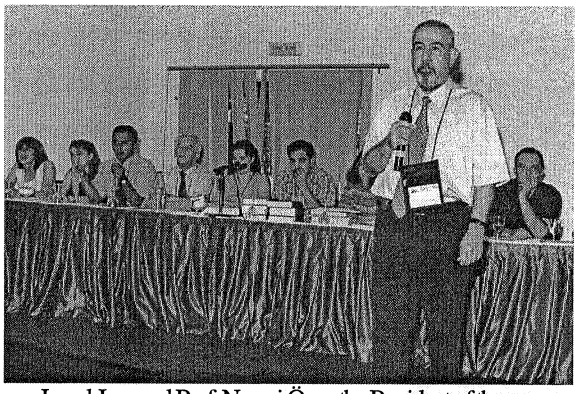
Tuesday 11 July 2000 - Practical Test Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
07:00	Breakfast	08:30	Breakfast
08:00-12:30	Practical test	10:00	City tour & a visit to Antalya Museum
		13:00	Lunch
15:00	Meeting coordinators	15:00	Meeting competitors
19:00	Dinner	19:00	Dinner
20:00	Cultural event	20:00	Cultural event

Wednesday 12 July 2000 - Translation Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
07:30	Breakfast	07:30	Breakfast
08:30	City tour & a visit to Antalya Museum	09:00	2nd Jury Session:approval and translation of theoretical test
13:00	Lunch	13:00	Lunch
	Free time	14:00	1st Jury Session (continued)
19:00	Dinner	19:00	Dinner
	Free time	20:00	1st Jury Session (continued)

Programme



Local Jury and Prof. Nazmi Özer, the President of the International Jury

Thursday 13 July 2000 - Theoretical Test Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
07:00	Breakfast	08:30	Breakfast
08:00-12:30	Theoretical test	10:00	3id Jury session
13:00	Lunch	13:00	Lunch
14:00	Meeting coordinators	14:00	Meeting competitors
	Free time		Free time
19:00	Dinner	19:00	Dinner
	Free time	20:00	Coordinators meeting

Friday 14 July 2000 - Excursion Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
07:00	Breakfast	07:00	Breakfast
08:00-18:30	Excursion to historical and touristic sites	08:00-18:30	Excursion to historical and touristic sites
19:00	Dinner	19:00	Dinner
	Free time	20:00	4th Jury session

Saturday 15 July 2000 - Award Ceremony Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
07:00	Breakfast	07:00	Breakfast
08:00-10:00	Examining test papers	08:00-10:00	Examining test papers
12:00	Lunch	12:00	Lunch
14:00	Closing & Award Ceremony	14:00	Closing & Award Ceremony
15:30	Yacht tour	15:30	Yacht tour
20:00	'Good-bye' dinner (Altis Golf Hotel)	20:00	'Good-bye' dinner (Altis Golf Hotel)

Sunday 16 July 2000 - Departure Day

Competitors		Adults	
Time	**Activity**	**Time**	**Activity**
07:00	Breakfast	07:00	Breakfast
Ongoing	Check out Bus transfers to Antalya International Airport	Ongoing	Check out Bus transfers to Antalya International Airport

Visiting historical sites

4. Theoretical and Practical Tests
4.1. Practical Test

4.1.1. Laboratory I:

Plant Anatomy, Morphology and Taxonomy

Dear Competitor,

This laboratory consists of two separate tasks.

you will begin with either Task I or Task II. you will move to the other task after 30 minutes.

Please make sure that the task paper given to you fits the task on your table.

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____

Task 1: Making Sections of Plant Tissues. Identification of Tissue Types. Interpretation of Structures (30 minutes; 25 points)

Materials: Plant tissue samples

İnstruments:

- Razor blade
- Stains
- Slides and cover slips
- Microscope (10x and 40x)

1. Make a transverse section of the leaf sample no.1 . If necessary, use a foam slice (make a split in the foam with a razor blade and place some fragment of the sample in it and obtain a section). Prepare a wet mount, and examine tissues. Choose one correct answer code to fill in the blanks 1.1 and 1.2.

1.1. The order of the major tissues. Which of the following is the correct sequence of tissues? Fill in the blank with one correct answer code. (5 points)

01. Upper epidermis, mesophyll consisting of one cell type, lower epidermis.
02. Upper epidermis, palisade parenchyma, spongy parenchyma, palisade parenchyma, lower epidermis.
03. Upper epidermis, palisade parenchyma, spongy parenchyma, lower epidermis.

Answer code: _____

1.2. Leaf type according to the arrangement of tissues. Fill in the blank with one correct answer code. (2 points)

01. Dorsiventral / Bifacial
02. Unifacial
03. Equifacial

Answer code: _____

2. Obtain a <u>transverse</u> section of the stem sample no:2 and prepare a wet mount. Make sure that your section is thin enough to examine cell types. Take the water medium out from one side of the cover slip by a filter paper and at the same time add a few drops of the Phloroglucine (Flg-HCl) stain from the other side until the stain covers all the cover slip square. Wait for a few minutes until some cell walls get pink-red in colour. Go through 2.1 and 2.2.

2.1. First, examine the general histological structure of the stem at a magnification of 10x, then choose correct answer code to fill in the blanks 2.1.1 and 2.1.2.

2.1.1. Which of the following does the stem sample belong to ?
Fill in the blank with one correct answer code. (6 points)

01. The stem sample belongs to a dicotyledon.
02. The stem sample belongs to a horsetail.
03. The stem sample belongs to a monocotyledon.
04. The stem sample belongs to a clubmoss.
05. The stem sample belongs to a cycad.
06. The stem sample belongs to a fern.

Answer code:_____

2.1.2. Which of the following is the stele type of the stem sample?
Fill in the blank with one correct answer code. (4 points)

01. Stele type is actinostele - Xylem arranged in star shape
02. Stele type is plectostele – Vascular tissue arranged centrally but irregular shaped
03. Stele type is haplostele - Cylindrical core of xylem surrounded by phloem
04. Stele type is solenostele – Phloem is inside and outside of xylem
05. Stele type is atactostele – Vascular bundles scattered
06. Stele type is eustele - Vascular bundles surrounding a central pith

Answer code: _____

2.2. Now, magnify a single vascular bundle at a magnification of 40x and examine it in detail, then choose correct answers to label the appropriate parts shown as W, X, Y and Z in Figure 1. (4 points)

code	term	code	term
01.	Fiber	02.	Protoxylem canal
03.	Phloem	04.	Tracheid
05.	Metaxylem vessel	06.	Xylem parenchyma

Answer codes: W:_____, X:_____, Y:_____, Z:_____

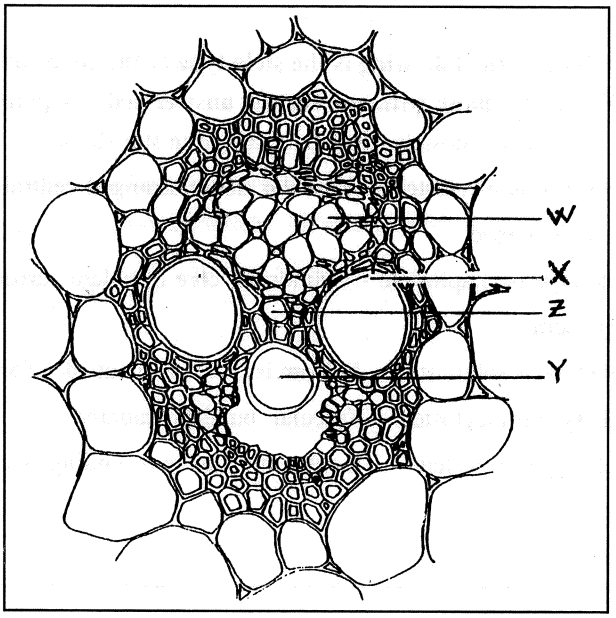
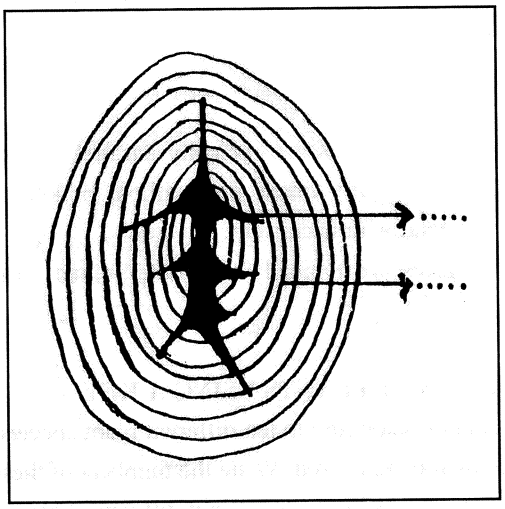


Figure 1

3. **Prepare a slide of <u>a thin section</u> of the cotyledons of a bean (*Phaseolus*) seed (sample no 3) by <u>shaving</u> with a razor blade and drop some Iodised Potassium Iodide (IKI) onto these pieces to stain. Place a cover slip carefully on the preparation. Draw a starch grain and label the hilum with an asterisk. (4 points)**



Task 2: Identification and Grouping of the Plants and Making Interpretations (30 minutes, 25 points).

Objective: To identify the plant species by using a key. Interpretation of the morphological characteristics. Finding the relationships between the body parts of the plants.

Materials and Instruments: Samples of various plant groups. Sample of seeds and leaves. A stereo binocular microscope, forceps, dissection needles, a ruler, razor blades.

Introduction:

Monocotyledons: The leaves are typically parallel or pinnate parallel veined, laminae are usually linear and without petiole. Flowers have usually sepal and petal with nectarium.

Dicotyledons: Leaves are typically reticulate veined with petiole and wide laminae.

IDENTIFICATION OF PLANTS USING A KEY

Ten plant specimens belonging to ten different plant species are given to you. Each specimen is numbered. Write the numbers of these specimens on the appropriate blanks in the key. Eight different diagnostic characteristics are given in the the tables (1-7) Using the characteristics in these tables and the key, identify the specimens.

DESCRIPTION OF SOME CHARACTERISTICS:

Figure 1.

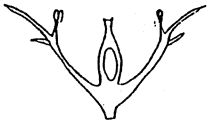
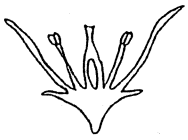
TYPES OF OVARY		
Inferior ovary	**Half-inferior ovary**	**Superior ovary**
		

Figure 2.

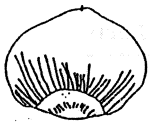
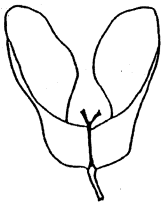
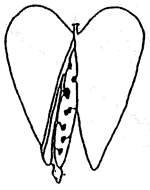
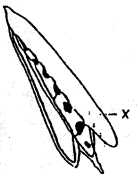
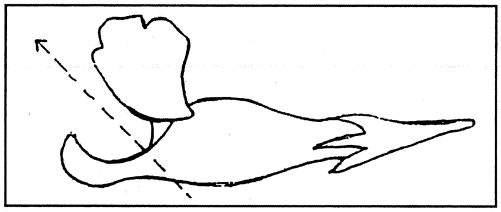
TYPES OF THE FRUITS			
			
A) Achene	B) Nut	C) Caryopsis	D) Samara
			
E) Follicle	F) Silicula	G) Siliqua	H) Legume

Figure 3. Flower Symmetries:

Zygomorphic flowers: Single (one) symmetric flowers.



Actinomorphic flower: Multiple (more than two) symmetric flowers.

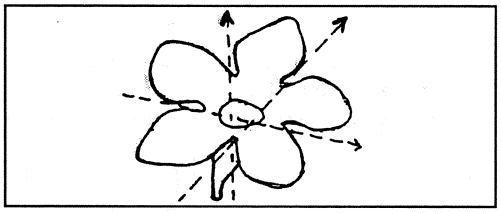


Figure 4.

Flower Parts

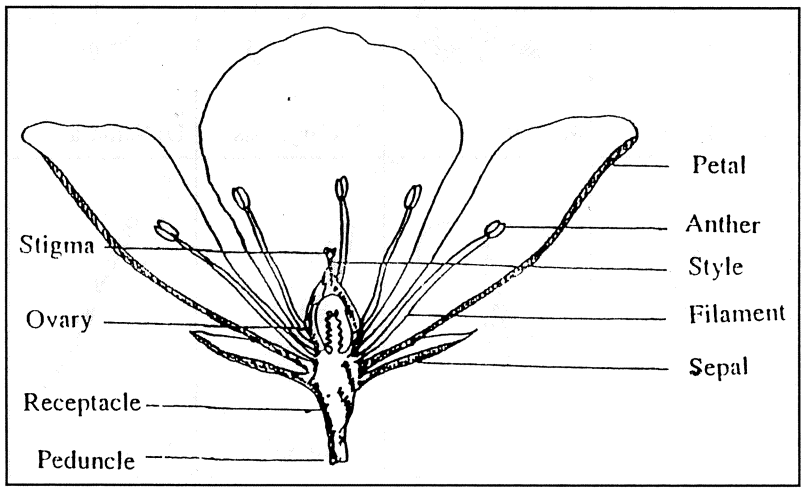


Figure 5.

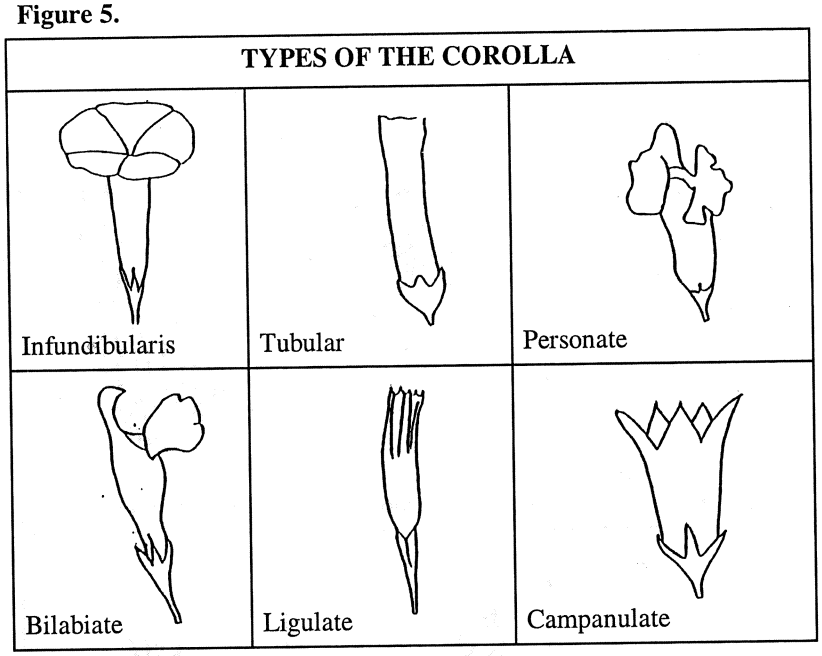


Figure 6.

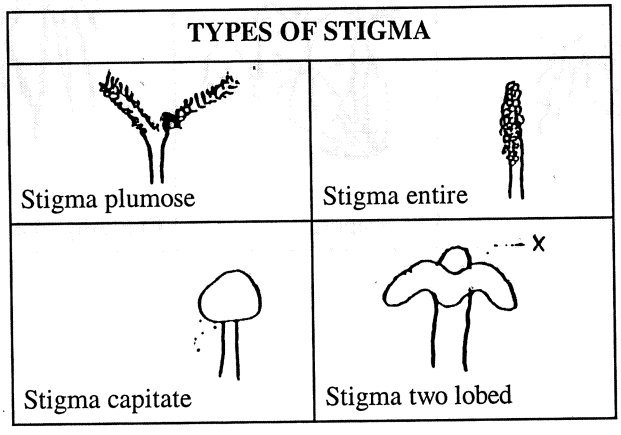
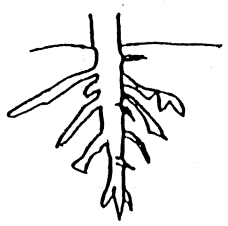
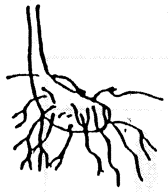
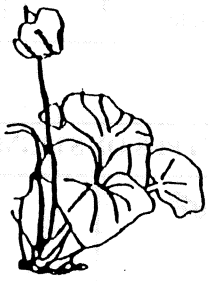


Figure 7.

TYPES OF THE ROOTS AND THE STEMS		
 A) Tap root	 B) Fibrous root	 C) Woody root
 D) Tuber	 E) Scapose	 F) Fleshy root

2.1. IDENTIFICATION BY USING A KEY

Write the numbers of the plants given below in the blanks in the key. Each correct answer is 1.5 points (Total 15 points).

1. Alyssum corsicum
2. Onosma isauricum
3. Senecio vernalis
4. Nepeta racemosa
5. Muscari neglectum
6. Moltkia coerulea
7. Lamium garganicum
8. Delphinium staphisagria
9. Ptilostemon chamaepeuce
10. Linum mucronatum

1- Plant monocotyledons..... ___
1- Plant dicotyledons
  2- Ovary inferior
    3- Achene 2-3 mm; corolla yellow..... ___
    3- Achene 3.5-5 mm; ligulate flowers pink..... ___
  2- Ovary superior
    4- Flowers actinomorphic symmetric
      5- Stamens 6..... ___
      5- Stamens 5
        6- Petals free ..... ___
        6- Petals compound
          7- Stigma entire; stamens arise from the corolla ..... ___
          7- Stigma small, capitate or bilobed; stamens included in corolla tube..... ___
    4- Flowers zygomorphic symmetric
      8- Sepal 5; fruit follicle ..... ___
      8- Sepal 5 or many; fruit nutlets
        9- Bracteoles (small bracts) 3-10.5 mm; calyx teeth (notches) 2-9 mm..... ___
        9- Bracteoles (small bracts) 2-3 mm; calyx teeth (notches) 1-2 mm ..... ___

2.2. IDENTIFICATION OF THE TYPES OF THE PLANT PARTS

Using the table of root and stem types given above (Figure 7), fill in the blanks with a code from the figure, to identify A and B in sample 11 (4 points).

Sample 11 A)_____

Sample 11 B)_____

2.3. IDENTIFICATION OF THE FRUIT TYPES

You will find some fruit samples numbered as 12, 13 and 14 on your table. Using the fruit types in the figure given above (Figure 2), write the code of the fruit types on the blanks (6 points).

Sample 12: _____

Sample 13:_____

Sample 14:_____

4.1.2. Laboratory II:

Animal Anatomy, Morphology and Taxonomy

Dear Competitor,

This laboratory consists of two separate tasks.

You will begin with either task i or task ii. you will move to the other task after 30 minutes.

Please make sure that the task paper given to you fits the task on your table.

You will be guided by the instructors during the desk change .

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____

Laboratory II- Task 1:

Calculating Biomass of Microscopic Animals By Using Their Body Length (30 minutes; 25 points)

Objectives:

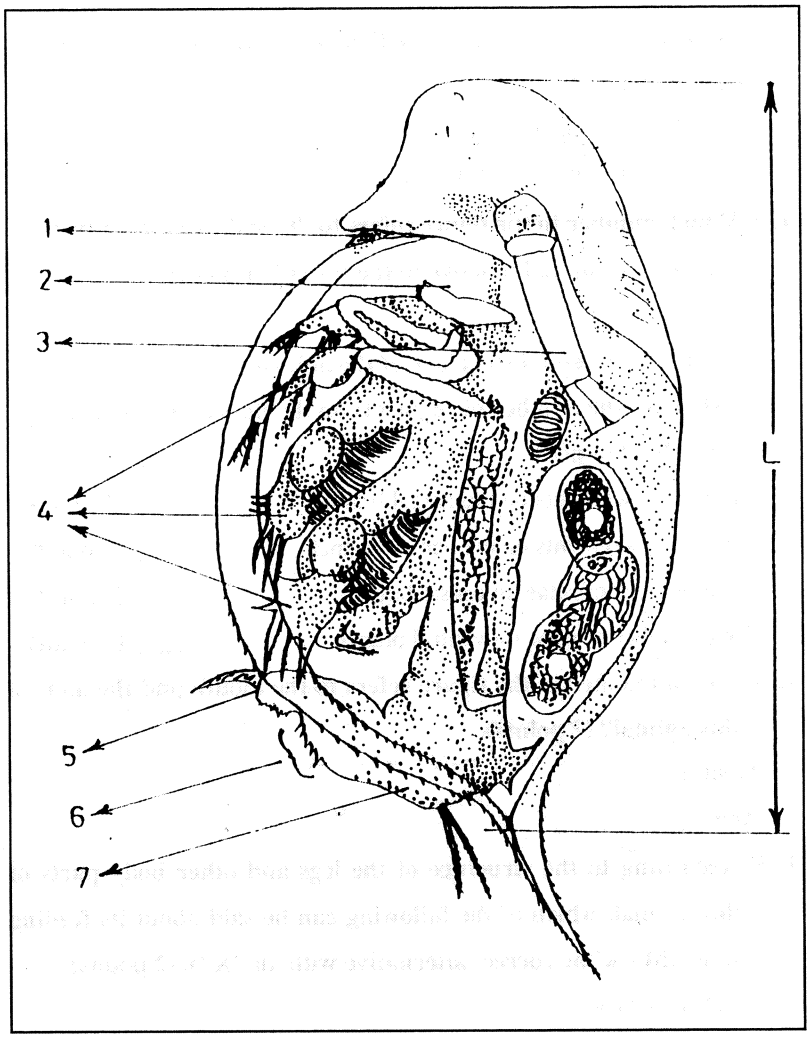
To evaluate the ability of the competitors to make biological preparations

To evaluate the ability of the competitors to use a microscope

To evaluate the ability of the competitors to make measurements under a microscope

To evaluate the ability of the competitors to use the obtained results in a formula

Dear Competitors, you are given on your table, slides, cover slips, glycerine, water, forceps, a stage micrometer, an ocular micrometer (already mounted in the microscope), a light microscope, a calculator and specimens of a species from Crustacea (in a petri dish).



1- Take 3 of these specimens and make a preparation. Examine your preparation under the light microscope.

After observing the morphology of the animal, answer the following questions:

1. 1. How many compound and ocelli (simple) eyes does this animal have? (1 Point).

Number of compound eyes: _____

Number of ocelli (simple) eyes: _____

1. 2. Which number in the figure refers to the main structure that enables the animal to move in the water? (1 point).

_____

1. 3. About the antennal structure of the animal:

What are the number of segments on the dorsal and ventral branches? (6 points).

Number of segments on the dorsal branch _____**(2 points)**

Number of segments on the ventral branch _____**(2 points)**

Total number of setae on dorsal branch _____**(1 point)**

Total number of setae on ventral branch _____**(1 point)**

1. 4. Which number in the figure refers to the mouth and the anus of this animal? (2 points).

Mouth: _____

Anus: _____

1. 5. According to the structure of the legs and other body parts of this animal, which of the following can be said about its feeding style?(Mark the correct alternative with an "X"). (2 points)

___A) Detritovorous

___B) Predator

___C) Filtrate-feeder

___D) Parasitic

2- Determine the total body length of each specimen by using the micrometers and write them in the blanks. (4 points).

A) Total body length of the 1st specimen (L_1): _____mm

B) Total body length of the 2nd specimen (L_2): _____mm

C) Total body length of the 3rd specimen (L_3): _____mm

D) Arithmetic mean of the total body lengths L_M:= _____mm

$$L_M = \frac{L_1 + L_2 + L_3}{3}$$

3. Calculate the lnW and biomass (W) by applying the mean total body length (L_M), "lna" and "b" values (lna= 1.6729 and b= 2.6880) that you have found, in the formula below (3 points).

$\ln W = \ln a + b \ln L_M$

(lna= 1.6729 and b= 2.6880)

a) lnW: _____

b) W: _____µg

Task 2:

Systematic Zoology: Grouping By Using Systematical Characters and Constructing a Key; Drawing a Phylogenetic Tree; Making Conclusions About the Life Styles Based On These Characters (30 minutes; 25 points)

Objectives:

Realizing the taxonomical characters by the naked eye or by a microscope.

Grouping characters

Constructing a key based on the characters

Making conclusions about the life styles based on the characters

Instruments: Binocular microscope, dissection pins, forceps.

Material: Specimens of 7 insect species.

PS. As the materials are dry, please be careful not to break the body parts. Examine the specimens by holding only from the pins.

Introduction: It is generally assumed that all living organisms have a phylogenetically common ancestor. During their evolutionary development they have adapted to their habitats. By looking at these characteristics it becomes possible for us to determine (by constructing keys), interpretations about their common ancestors and life styles.

2.1. Construction of a key

Living things have some common characters which become gradually more specific along the line from large taxonomic categories down to the individual level. Based on these characteristics, living things are classified and keys are constructed for their identification.

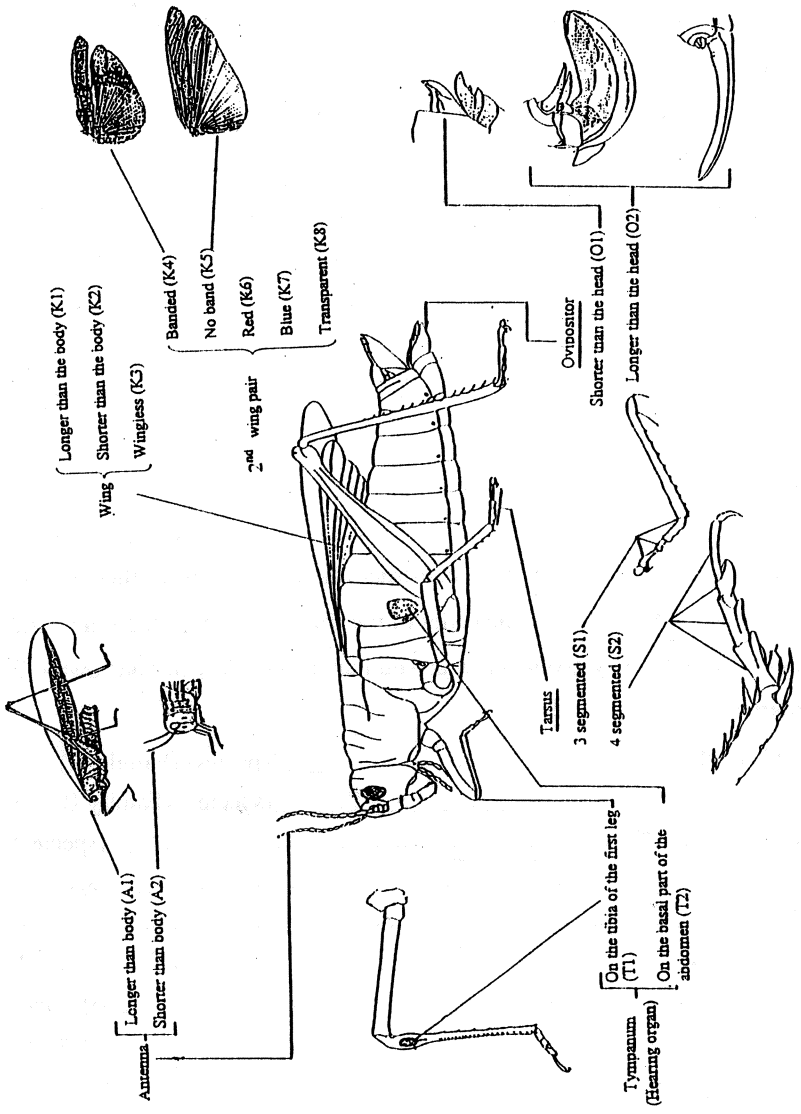
In order to determine a given specimen or to make identification keys for the living things from different groups their characteristics have to be known and grouped. In choosing these characteristics the degree of differentiation shows their degree of relatedness. Therefore grouping them starting from the ones with the most different structures and using these in the identification keys and constructing the phylogenetic trees according to these is the basis of the procedure.

For this purpose a hypothetical figure of grasshoppers (Orthoptera: Caelifera and Ensifera) is given.

In this figure, in order to guide you to find the places of these characteristics, characteristics of different groups and species are given in a combined manner. Naturally, all these characters may not be found on the same individual. While some of them can be seen with the naked eye, others can be seen more clearly with a stereo binocular microscope like the one on your table.

There are specimen belonging to 7 different insect species on your table. Of these, the ones numbered from 1 to 6 belong to two different families.

The seventh specimen on the other hand belongs to a different family and will be used later for another purpose in the section 2.3. Group the numbered specimen from 1 to 6 by using the characters that are given to you in the hypothetical figure. You may group them starting from general to more specific features. In other words group them by starting from the most general character and work through until you reach a characteristic that is found only in one specimen. Use the groupings to construct a dichotomous key. While doing this, consider the common characteristis of the specimens and separate them first on the family basis and then according to their species.


Longer than the body (K1)
Shorter than the body (K2)
Wingless (K3)
Wing
Banded (K4)
No band (K5)
Red (K6)
Blue (K7)
Transparent (K8)
2nd wing pair
Ovipositor
Shorter than the head (O1)
Longer than the head (O2)
Tarsus
3 segmented (S1)
4 segmented (S2)
Longer than body (A1)
Shorter than body (A2)
Antenna
On the tibia of the first leg (T1)
On the basal part of the abdomen (T2)
Tympanum (Hearing organ)

A model key (The codes used here are arranged in order to guide you).

1.Character code: A1, T2, K3 etc __4_, __6__ (species) (Family-A).....2

--A2, T1, K1 etc __1_, __2__, __3__, __5__ (species) (Family-B)....3

2.K2, S1 ..... ___ (species)

--K4, S2 etc ..... ___ (species)

3..... 4

-- 5

4..... ___ (species)

-- ..... ___ (species)

5..... ___ (species)

..... ___ (species)

By using these characteristics, construct a key according to their family and species. You may use the codes of the characteristics in the figure and put them in the key given below or you may make a key of your own (15 points).

1.Character code: ..... ____, ____, (species) (Family-A).....2

-- ..... ___, ____, ____, ____,(species) (Family-B)....3

2..... ___ (species)

-- ..... ___ (species)

3..... 4

-- 5

4..... ___ (species)

-- ..... ___ (species)

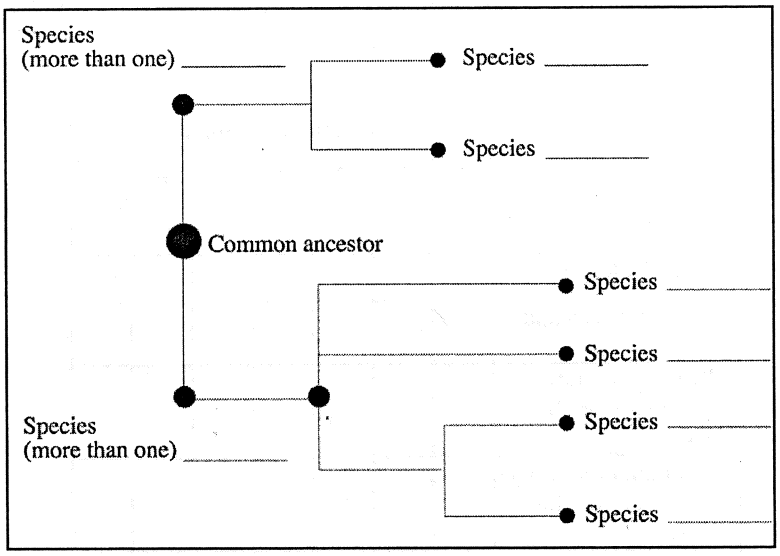
5..... ___ (species)

..... ___ (species)

2.2. Construction of a phylogenetic tree (5 points)

During the evolution process the last separated (branched) populations (here species) are the ones which have the most close ancestor and therefore have much more similar characteristics. Handle the specimens from this point of view.

After examining the specimen morphologically design a schema for a phylogenetically branched relationship tree by using similar characteristics.



2.3. Determination of the Characteristics and Establishing the Relationships Between the Characteristics and the Life-Style (5 points).

It is a biological reality that there is a close relationship between the morphological characters of the living creatures and their life-styles. It is therefore possible to make deductions about the life-styles or their biology depending on their morphological characteristics. In the table below, the biological characteristics are given in the left column relating to specimens 1 to 7. Mark with an "X" in the appropriate boxes for each species. Some species may have more than one characteristics and many species may show the same characteristic.

	Specimen number						
Characters	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Lives in steppes							
Lives underground							
Lives in herbs and shrubs							
Tympanal (auditory) organs are on the first leg							
Tympanal (auditory) organs are on the body							
Raptorial type feet (feet modified for grasping)							
Jumping type feet							
Digging type feet							

4.1.3. Laboratory III:

Biochemistry (60minutes; 50 Points)

Task: Agarose Gel Electrophoresis of DNA and Stain Samples

Notice !

One power supply is for three students

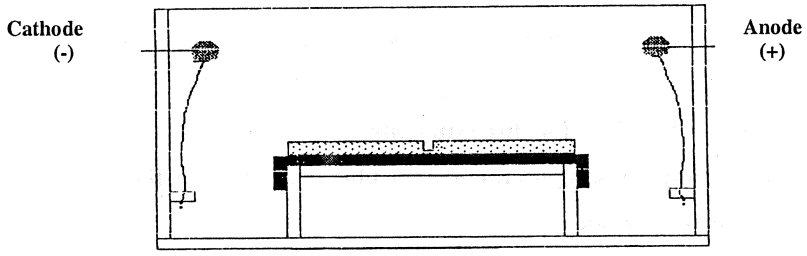
After loading the samples remove the black paper under the electrophoresis tank

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____



Electrophoresis Tank

Introduction:

Electrophoresis is an analytical method frequently used in molecular biology and medicine. The net charge on the molecules effect their migration in an applied electric field. The electrophoresis technique depends on this principle.

Agarose gel electrophoresis is used to provide information for ;

- identification of DNA and RNA isolated for several purposes
- to check the purity of DNA
- to determine in what form it is
- to estimate the size of DNA

Purified agarose, in powdered form, is insoluble in water at room temperature. In order to dissolve it one might boil it in buffer or water. When it starts to cool, it undergoes polymerization. After polymerization the samples are loaded in the lanes preformed in the gel.

The factors that affect the migration rate of molecules in the agarose gel are as follows;

- molecular size
- agarose concentration
- applied voltage
- molecular conformation and size
- temperature
- the composition of electrophoresis buffer

EXPERIMENTS

Reagents:

- Stains:
  - Trypan blue
  - Acid yellow
  - Bismarck brown
  - Methyl green
  - Fuchsin
  - Marker stain
- DNA samples:
  - DNA sample I
  - DNA sample II

(A stain that binds to DNA is added to the DNA samples to visualize it)

- 40% sucrose solution
- 1% agarose gel (previously prepared)
- Tris-Borate-EDTA Buffer (1mM Tris, 0.1 mM Boric acid, 2 mM EDTA, pH 8.3)

Material and Equipment

- 2- 20 µl micropipets + pipet tips
- 1.5 ml eppendorf tubes and tube holders
- gloves
- electrophoresis tank and gel tray
- power supply
- marker pencil

PRELAB NOTES

You have been given five organic stains, one marker stain [mixture of three stains; orange II (MW=350), xylene cyanole (MW= 538.6), bromophenol blue (MW=691)] and two separete DNA samples [human genomic DNA (~ 3 x 10^9 bp) and plasmid DNA (less than 5 x 10^3 bp)]. In this experiment agarose gel with preformed lanes is ready made for you. Load your samples in the gel as follows and evaluate your results.

Please wear your gloves throughout the experiment.

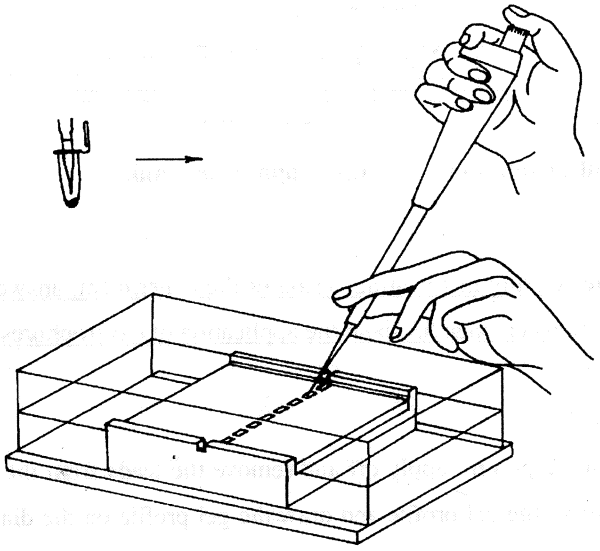
Step 1: Preparation of Samples

Add to each of the tubes which contains a stain or a DNA sample, 5µl of the 40% sucrose solution. Use a fresh pipet tip for each reagent.

Tube No			
1.	5µl Trypan blue	+	5µl 40% sucrose
2.	5µl Acid yellow	+	5µl 40% sucrose
3.	5µl Bismarck brown	+	5µl 40% sucrose
4.	5µl Methyl green	+	5µl 40% sucrose
5.	5µl Fuchsin	+	5µl 40% sucrose
6.	5µl Marker stain	+	5µl 40% sucrose
7.	5µl DNA sample I	+	5µl 40% sucrose
8.	10µl DNA sample II	+	5µl 40% sucrose

Step 2: Loading Samples in the Lanes

Tris-Borate-EDTA buffer (pH 8.3) have been poured over the gel in the electrophoresis chamber before. Place each sample prepared in step 1 into its separate lane in the middle of the agarose gel in the order on page 50 Use a clean micropipet tip for each sample. Insert the tip of the micropipet above the well. When loading samples in the gel, be careful not to puncture the bottom of the well.



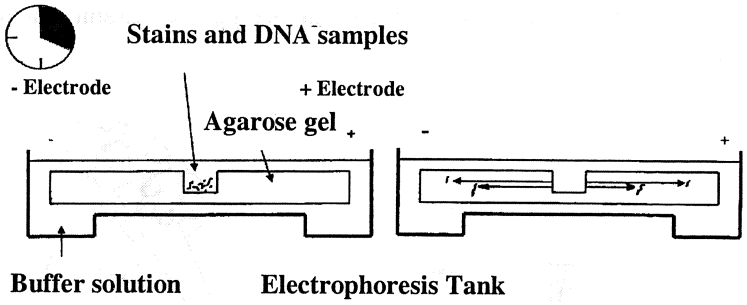
Step 3:

Close the lid of the electrophoresis chamber and attach the leads on the lid to the power supply. Turn the power supply on. (Red to positive and black to negative)

Step 4

Run the gel at approximately 90 volt for 20 minutes.

Caution! Do not touch the chamber or place fingers in the buffer once power has been turned on



Note: During this waiting period of the experiment, answer the Group A questions on page 53 about the application of electrophoresis.

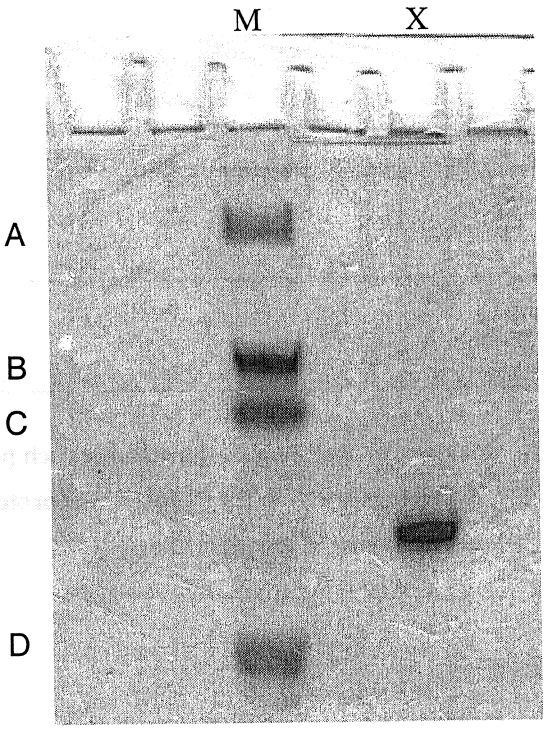
Step 5

Turn the power supply off and remove the leads from the power supply. Observe the gel profile and draw the gel profile on the diagram given on page 12 and answer the B group questions.

QUESTIONS

Group A questions (about the application of electrophoresis)

I. Given below is the SDS-PAGE (Sodium dedocyl sulphate-polyacrylamide gel electrophoresis) profile of protein (X) purified in the laboratory and molecular weight standards (M).

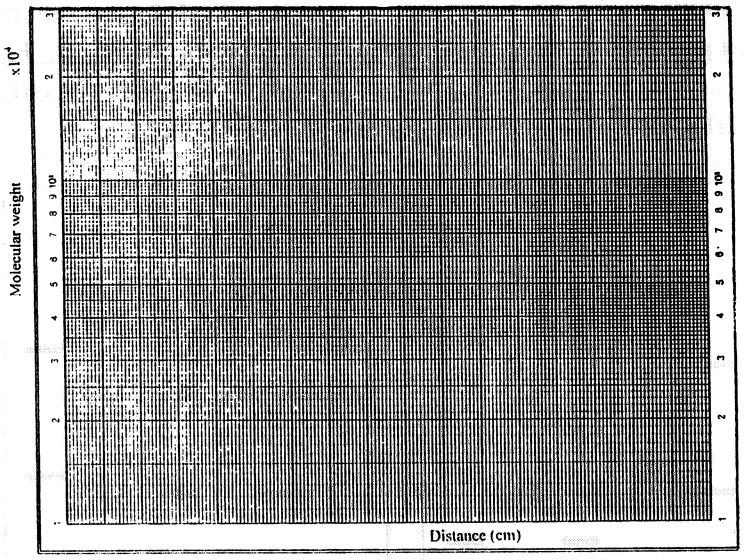


The molecular weights of the protein standards are given in the table below .

Protein	Subunit molecular weight	Migration distance (cm)
Protein-A	140.000	_____
Protein-B	100.000	_____
Protein-C	86.000	_____
Protein-D	45.000	_____
Protein-X	?	_____

1. **Measure in centimeters, the distance each protein migrated in the gel (from the well to the middle of the protein band). Fill in your measurements in the table above.**

2. Plot the molecular weights versus the migration distance (cm) on the semilogarithmic paper below. (10 points)

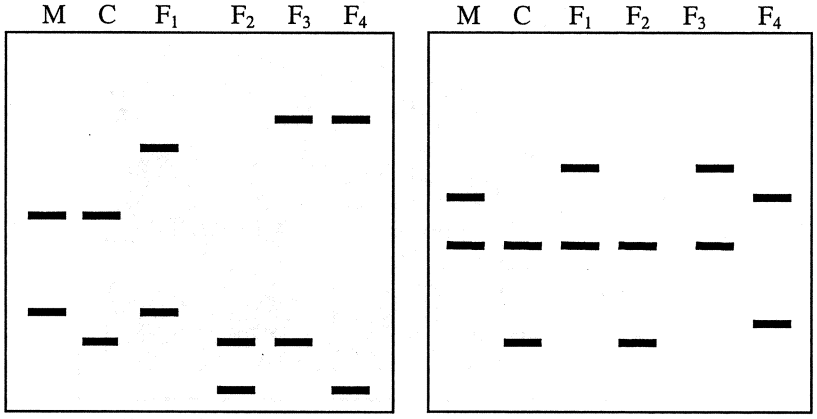


3. What is the subunit molecular weight of protein X ? (5 points)

_____

II. To settle a paternity dispute, DNA fingerprinting is used in the forensic laboratory. The same two DNA loci from the child, mother and possible fathers which appear in a randomly repeated fashion in the genome have been chosen for analysis. These fragments are called variable number tandem repeats (VNTRs); each individual should inherit one allele of a particular size containing a VNTR from one parent and a homologous but not

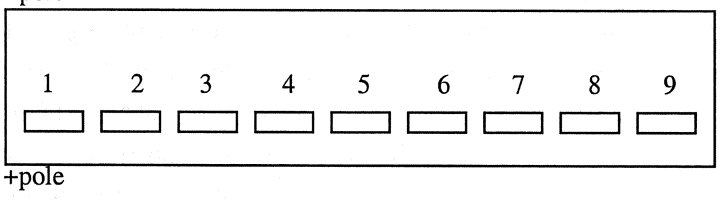
necessarily identical allele with the same VNTR from the other parent. In this experiment two VNTR DNA's of each individual have been amplified by PCR and PCR fragments were run on the agarose gel. Shown below are the results of DNA fingerprinting gel profiles. Based on this fingerprinting analysis who (F_1, F_2, F_3, F_4 or none) can be the true biological father ? (10 points) MARK THE CORRECT ANSWER BELOW WITH AN "X".



(M= mother, F= father, C= child)

___A) F_1 ___B) F_2 ___C) F_3 ___D) F_4 ___E) none

Group B Questions (answer these questions after you finish the electrophoresis)



Draw the gel profile (bands) on the diagram above (1point) and answer the following questions.

I. Fill in the blanks with the appropriate well number.

1. The stain/stains in lane/lanes number _____ is/are neutral. (3 points)
2. The stain/stains in lane/lanes number _____ is/are positively charged. (3 points)
3. The stain/stains in lane/lanes number _____ is/are negatively charged. (3 points)
4. The sample in lane number _____ is plasmid DNA. (3 points)
5. The sample in lane number _____ is human genomic DNA. (3 points)
6. The stains in lane/lanes number_____ can be used to stain DNA. (3 points)
7. Of the two stains that move toward the positive electrode the MW of stain _____ is larger than the MW of stain_____ . (3 points)
8. Of the two stains that move toward the negative electrode the MW of stain _____ is larger than the MW of stain_____. (3 points)

4.1.4. Laboratory IV:

Ecology

Task: Determination of the Community Structures In Different Soil Horizons (60 minutes; 50 points).

COUNTRY: _____

FIRST NAME: _____

LAST NAME: _____

CODE:_____

Introduction

Soil is very important for terrestrial ecosystems because it includes biotic elements and is a source of abiotic components for these elements.

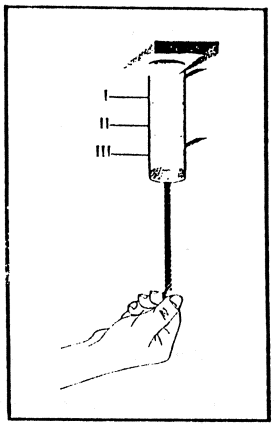
Soil is not only an environmental factor for the organisms being a suitable place for sheltering, finding food and dispersal but also the living organisms and their waste products are added to the formation of the soil by mixing with it. A cross section from the surface to the depth is referred to as the soil profile. If a profile of this kind is observed with the naked eye, one might see different layers called horizons. The structure and content of a soil horizon determines the dispersal of its plants and animals, depending on their ecological requirements.

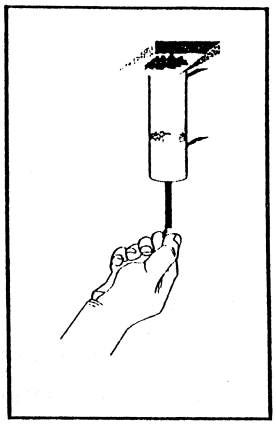
An experimental soil profile is given to you consisting of three horizons. The aim of the experiment is to distinguish these three horizons, to determine their faunistic structure and to determine the structure of the soil community under the light of knowledge that is given to you in the material and methods section.

Material and Methods:

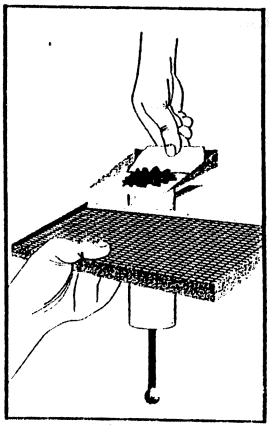
1. Examine the soil profile in the experimental design that is given to you and distinguish the different soil horizons.

Move the piston by using the screw under the mechanism until it rises to the place where two different horizons intersect.

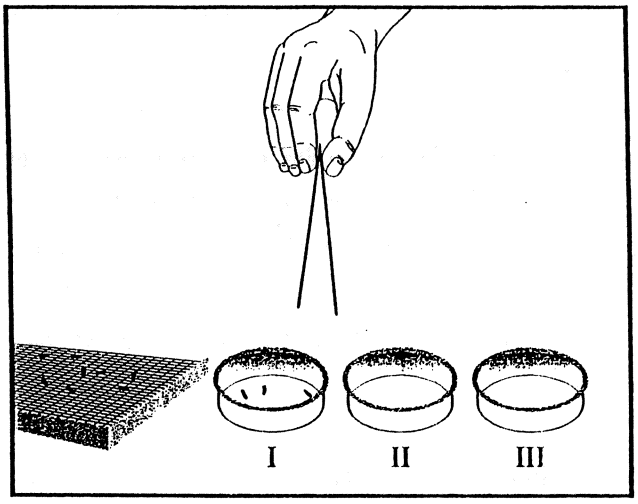




Sweep the soil and sift through it with the spatula



Put the organisms of this horizon into a petri dish



Repeat this process for each horizon

2. **Determine the organisms of each horizon systematically according to the categories given in Table 1. (See page 63)**

   You may use the instruments provided like spatula, forceps, petri dish etc. You can use the water in the petri dish, if you have trouble distinguishing objects in the dusty sample, with your naked eye.

3. **Fill in Table 1 by counting the organisms for each horizon. (5.5 points)**

   To do this, identify all the organisms according to the categories given in Table 1 and count them all for each horizon. Write the data for each category in Table 1.

4. Calculate the abundancy and diversity of the organisms for each category in each horizon. Marks: (Abundancy: 11 points; Diversity: 9 points)

In order to make the calculations you may use the following formulas. Write the results in the related boxes in Table 1 for every specimen, in every horizon. The abundancy shows the proportional distribution of a given species in a community and can be calculated using the formula presented below. According to the given formula write the data to the referred boxes in the Table 1 and make the calculations for each horizon and each specimen.

$$\text{Abundancy} = \frac{n}{N} x100$$

N = Total number of individuals in all categories

n = Number of individuals in a category

Diversity is the richness of a community and can be calculated by the given formula. Write the results of the total diversity data for each horizon in the appropiate box.

$$Diversity = \frac{(S-1)}{\ln N}$$

N = Total number of individuals in all categories.

S= Total number of categories.

Table 1

	Horizon I			Horizon II			Horizon III		
Category	Number	% Abundancy	Diversity	Number	% Abundancy	Diversity	Number	% Abundancy	Diversity
(A) Myriapoda (Centipedes+ Millipedes)			xxxx			xxxx			xxxx
(B) Isopoda (Wood Lice)			xxxx			xxxx			xxxx
(C) Orthoptera (Grasshoppers Crickets)			xxxx			xxxx			xxxx
(D) Coleoptera (Beetles)			xxxx			xxxx			xxxx
(E) Hemiptera (True Bugs + Sapsuckers)			xxxx			xxxx			xxxx
(F) Hymenoptera (Ants + Bees + Wasps)			xxxx			xxxx			xxxx
(G) Homoptera (Cicadas + Aphids)			xxxx			xxxx			xxxx
TOTAL		**100**			**100**			**100**	

5. Calculate the similarity among the different horizons depending on their faunistic contents. (6 points)

Similarity refers to the degree of similarity among different communities and in order to find this, communities are compared two

by two with each other at a time. The similarity of any community to itself is 1.00 (i.e. 100%).

Please notice some important points while calculating.

Use the similarity formula given below in your calculations.

While performing your task, consider the **morphological differences** between organisms that you have found in each horizon (you can notice these differences by eye or by the magnifier). Although they are in the same category, assume that these are **different species called MS** due to their morphological differences. Make your calculations according to this assumption.

Write the results in the similarity table (Table 2) and make the proportional search.

$$\text{Similarity} = \frac{2A}{2A + B + C}$$

A= The number of common species (MS) between the communities

B= The number of species (MS) that is found only in the first community

C= The number of species (MS) that are only found in the second community.

Table 2

	Horizon I	Horizon II	Horizon III
Horizon I	**1.00**		
Horizon II		**1.00**	
Horizon III			**1.00**

6. Answer the following questions according to your results. (12.5 points)

6. 1. Which category shows the highest abundance in each of the three horizons (According to Table 1)? (Mark with the category label A-G on Table 1) (4.5 points)

Horizon I: _____

Horizon II: _____

Horizon III: _____

6. 2. Which horizon shows the highest diversity? (2 points)

Horizon _____

6. 3. Which horizon shows the lowest diversity? (2 points)

Horizon _____

6. 4. Which horizons show the highest similarity? (2 points)

Horizon _____ and horizon _____

6. 5. Which horizons show the lowest similarity? (2 points)

Horizon_____ and horizon _____

LOGARITHMIC TABLE

X	ln X	X	ln X	X	ln X	X	ln X
0	.....	3	1,09861	6	1,79176	9	2,19722
0,1	-2,30256	3,1	1,1314	6,1	1,80829	9,1	2,20827
0,2	-1,60944	3,2	1,16315	6,2	1,82455	9,2	2,2192
0,3	-1,20397	3,3	1,19392	6,3	1,84055	9,3	2,23001
0,4	-0,91629	3,4	1,22378	6,4	1,8563	9,4	2,24071
0,5	-0,69315	3,5	1,25276	6,5	1,8718	9,5	2,25129
0,6	-0,51083	3,6	1,28093	6,6	1,88707	9,6	2,26176
0,7	-0,35667	3,7	1,308303	6,7	1,90211	9,7	2,27213
0,8	-0,22314	3,8	1,335	6,8	1,91692	9,8	2,28238
0,9	-0,10536	3,9	1,36098	6,9	1,93152	9,9	2,29253
1	0	4	1,38629	7	1,94591	10	2,30259
1,1	0,09531	4,1	1,41099	7,1	1,96009	10,1	2,31254
1,2	0,18232	4,2	1,43508	7,2	1,97408	10,2	2,32239
1,3	0,26236	4,3	1,45862	7,3	1,98787	10,3	2,33214
1,4	0,33647	4,4	1,4816	7,4	2,00148	10,4	2,34181
1,5	0,40547	4,5	1,50408	7,5	2,0149	10,5	2,35138
1,6	0,47	4,6	1,52606	7,6	2,02815	10,6	2,36085
1,7	0,53063	4,7	1,54786	7,7	2,04122	10,7	2,37024
1,8	0,58779	4,8	1,56862	7,8	2,05412	10,8	2,37955
1,9	0,64185	4,9	1,58924	7,9	2,06686	10,9	2,38876
2	0,69315	5	1,60944	8	2,07944	11	2,3979
2,1	0,74194	5,1	1,62924	8,1	2,09186	11,1	2,40695
2,2	0,78846	5,2	1,64866	8,2	2,10413	11,2	2,41591
2,3	0,83291	5,3	1,66771	8,3	2,11626	11,3	2,4248
2,4	0,87547	5,4	1,6864	8,4	2,12823	11,4	2,43361
2,5	0,91629	5,5	1,70475	8,5	2,14007	11,5	2,44235
2,9	1,06471	5,9	1,77495	8,9	2,18605	11,9	2,47654
						12	2,48491

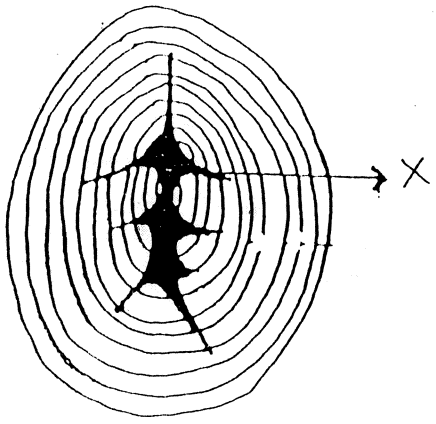
4.2. Answer Keys to the Practical Test

Laboratory I: Plant Anatomy, Morphology and Taxonomy
Task 1.

1.
1.1. Answer code: 01
1.2. Answer code: 02

2.
2.1.1. Answer code: 03
2.1.2. Answer code: 05
2.2. Answer code: W: 03 X: 05 Y: 02 Z: 04

3.



Task 2.

2.1.

5
3
9
1
10
6
2
8
7
4

2.2.

A) D
B) E

2.3.

Sample 12: H
Sample 13: B
Sample 14: A

Laboratory II: Animal Anatomy, Morphology and Taxonomy
Task 1.

1.

1.1.

Number of compound eyes: 1
Number of ocelli eyes: 1

1.2.

3

1.3.

4

3

4

5

1.4.

2

6

1.5.

C

2.

D) L_M: 1.5 - 3.0 mm

3.

a) lnW: 2.762 - 4.625

b) W: 15.84 - 102.10 µg

or

3.

a) lnW: 2.770 - 4.635

b) W: 15.94 - 103.03 µg

Task 2.

2.1.

1st Alternative

2

3

1 (or 4)

4 (or 1)

4

5

3 (or 5)

5 (or 3)

2 (or 6)

6 (or 2)

2.1.

2nd Alternative

2

3

1 (or 4)

4 (or 1)

4

5

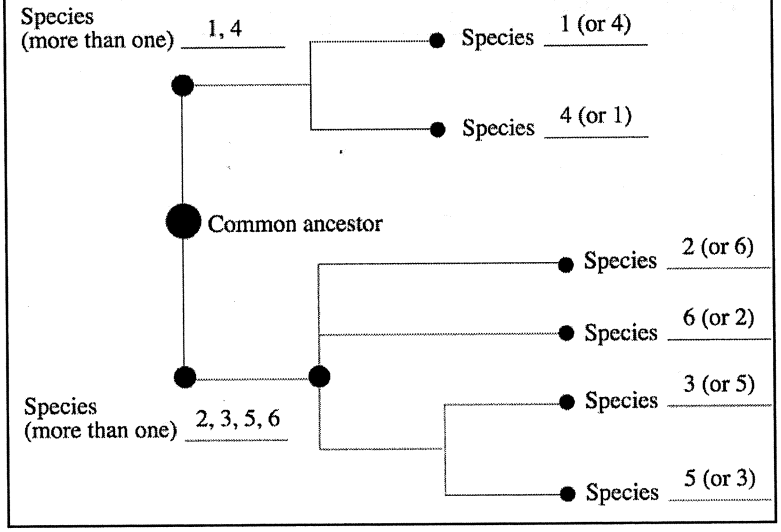
2 (or 6)

6 (or 2)

3 (or 5)

5 (or 3)

2.2.



2.3.

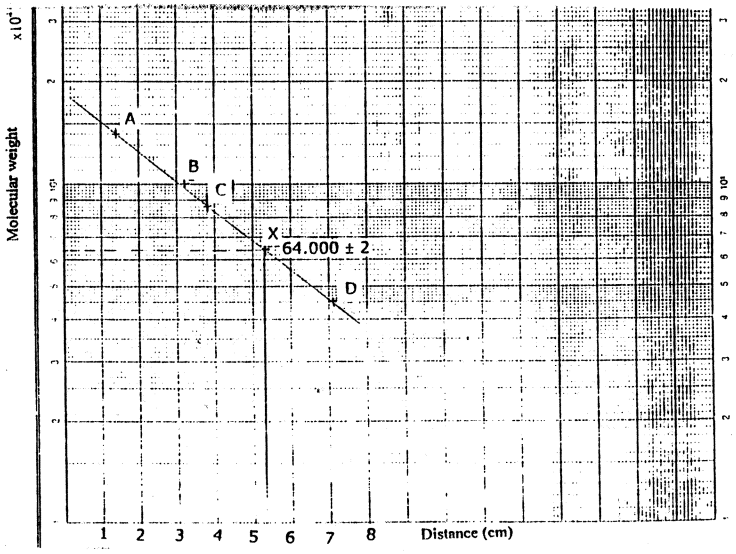
	Specimen number						
Characters	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Lives in steppes		X	X		X	X	
Lives underground							X
Lives in herbs and shrubs	X			X			
Tympanal (auditory) organs are on the first leg	X			X			X
Tympanal (auditory) organs are on the body		X	X		X	X	
Raptorial type feet (feet modified for grasping)							
Jumping type feet	X	X	X	X	X	X	
Digging type feet							X

Practical Test III: Biochemistry
Group A
I-

1.

Protein	Subunit molecular weight
Protein A	140.000
Protein B	100.000
Protein C	86.000
Protein D	45.000
Protein X	?

2.



3.

64.000 ± 2

II.

B

Group B
1: 3
2: 4, 5
3: 1, 2
4: 8
5: 7
6: 4, 5
7: 2, 1
8: 5, 4

Practical Test IV: Ecology

3.

Table 1

	Horizon I			Horizon II			Horizon III		
Category	Number	% Abundancy	Diversity	Number	% Abundancy	Diversity	Number	% Abundancy	Diversity
(A) Myriapoda (Centipedes+ Millipedes)	-	-	xxxxx	-	-	xxxxx	2	40.0	xxxxx
(B) Isopoda (Wood Lice)	1	8.33	xxxxx	1	20.0	xxxxx	-	-	xxxxx
(C) Orthoptera (Grasshoppers Crickets)	1	8.33	xxxxx	-	-	xxxxx	-	-	xxxxx
(D) Coleoptera (Beetles)	2	16.66	xxxxx	1	20.0	xxxxx	-	-	xxxxx
(E) Hemiptera (True Bugs + Sapsuckers)	2	16.66	xxxxx	-	-	xxxxx	-	-	xxxxx
(F) Hymenoptera (Ants + Bees + Wasps)	5	41.66	xxxxx	3	60.0	xxxxx	3	60.0	xxxxx
(G) Homoptera (Cicadas + Aphids)	1	8.33	xxxxx	-	-	xxxxx	-	-	xxxxx
TOTAL	12	**100**	2.0121	5	**100**	1.2426	5	**100**	0.6213

4. See Table 1

5.

Table 2

	Horizon I	Horizon II	Horizon III
Horizon I	**1.00**	0.36	0.18
Horizon II		**1.00**	0.50
Horizon III			**1.00**

6.

6.1.
Horizon I: F
Horizon II: F
Horizon III: F

6.2.
Horizon I

6.3.
Horizon III

6.4.
Horizon I and Horizon II

6.5.
Horizon I and Horizon III

4. 3. Theoretical Test

General remarks:

This test consists of two parts, **A and B**. In part A there are 103 multiple choice questions, each having only **one** correct answer. In part B there are 46 questions, each of which may have **more** than one answer.

In order to eliminate the consequence of guessing in the marking of Type A questions, one point will be deducted for every 5 incorrect answers. Failing to answer a question will not result in any penalty.

In the marking of Type B questions a percentage of the total mark for that question will be deducted for each incorrect answer. The minimum mark for each question with deductions will be zero.

For the multiple choice questions (type A) mark the correct answer with a cross "X" in the blank space provided. If you want to change your answer with a new one in order to cancel it, you may draw a parallel line on your old mark.

correct	delete
X	~~X~~

4.3.1. Theoretical Test - Part A

CELL BIOLOGY

1. In which way are the proteins transported from the site of synthesis to the cell membrane for secretion?

___A) By cytoplasmic movement

___B) By some signal proteins in the cytosol

___C) By protein-carbohydrate complex carrying signals in the cytosol

___D) By cytoskeleton elements

___E) By vesicles

2. What is the major difference between a vacuole and a vesicle?

___A) The membrane is thick in the vacuole but thin in the vesicle

___B) The vesicle is pinched off only from the cell membrane; the vacuole is pinched off from the Golgi apparatus

___C) The vacuole membrane is carbohydrate rich; the vesicle membrane is protein rich

___D) The vacuole is near the nucleus; the vesicle is near the Golgi apparatus

___E) The vacuole has a comparatively slow movement; the vesicle moves rapidly

3. Which of the following is <u>not</u> a function of the Golgi apparatus?

___A) Addition of sugars to proteins

___B) Storage of lipids

___C) Package of secretion products

___D) Formation of glycolipids

___E) Synthesis of polysaccharides from simple sugars

4. Which of the following functions are carried out in the smooth endoplasmic reticulum?

I) Addition of carbohydrates to proteins
II) Synthesis of membrane phospholipids
III) Addition of carbohydrates to lipids
IV) Synthesis of cholesterol
V) Detoxification of drugs

___A) I, II, IV

___B) II, III, IV

___C) II, IV, V

___D) I, IV, V

___E) I, II, V

5. Deleted

6. Fibroblasts are cells which synthesize proteins of the extracellular matrix of the connective tissue (collagen fibers), glycoproteins (fibronectin) and proteoglycans (dermatan sulphate). According to these features which organelle/organelles has/have the greater function in these cells?

___A) Rough endoplasmic reticulum and smooth endoplasmic reticulum

___B) Golgi apparatus

___C) Rough endoplasmic reticulum and free ribosomes

___D) Golgi and rough endoplasmic reticulum

___E) Rough endoplasmic reticulum

7. Four structures (I-IV) and some related functional and structural features (1-7) are given below.

I. Cilia

II. Basal bodies

III. Centrosome

IV. Flagellum

1- There is a 9+2 arrangement in a ring around a pair of single microtubules

2- Most of these structures are longer than the cell

3- It is shorter than the cell

4- There are nine groups of three microtubules, fused into triplets with an empty core

5- These are the main structures for movement

6- They function in the synthesis of spindle fibers

7- They bind cilia and flagella to the cell membrane

Which of the combinations below for structure and function are correct?

___A) I: 1, 3, 5	II: 3, 4, 5	III: 3, 4, 6	IV: 1, 2, 3
___B) I:1, 4, 5	II: 1, 2, 7	III: 2, 3, 4	IV: 1, 3, 5
___C) I:1, 4, 7	II: 3, 4, 5	III: 2, 3, 6	IV: 2, 3, 4
___D) I:3, 4, 6	II: 2, 4, 7	III: 3, 4, 5	IV: 4, 5, 6
___E) I:2, 4, 6	II: 2, 4, 7	III: 3, 4, 5	IV: 2, 4, 5

8. Which of the following contains a polar head and a non-polar tail in cell?

___A) Triglycerides ___B) Neutral lipids ___C) Wax

___D) Phospholipids ___E) All the above

9. Which of the following are the fibers that attach to the the cytoplasmic face of spot desmosomes?

___A) Collagen fibers

___B) Cytoskeleton fibers

___C) Elastic fibers

___D) Tubulin protein fibers

___E) Reticular fibers

10. Which of the following is the correct description of a microsome?

___A) It consists of vesicles detached from the Golgi apparatus

___B) It consists of vesicles containing waste products digested by the lysosomes

___C) It consists of various amounts of ribosomes and fragmented endoplasmic reticulum

___D) It is a vacuole that contains secretions

___E) It is a ribosome dimer

11. In aerobic respiration glucose is converted to pyruvate in the

___A) Inner mitochondrial membrane ___B) Cytoplasm

___C) Outer mitochondrial membrane ___D) Mitochondrial matrix

___E) Mitochondrial membrane interspace (intermembrane space)

12. Which of the following is the correct description for a porin?

___A) It is a protein in the structure of microtubules

___B) It is a protein located on the outer mitochondrial membrane

___C) It is a protein of the nuclear pores

___D) It is a lipid that functions in the addition of carbohydrates to proteins

___E) It is a protein that forms the cytoskeleton

13. How are the peroxisomes formed in a cell?

___A) Only by fission

___B) Only by detachment from a big peroxisome

___C) Both by fission and self-replication of a preexisting peroxisome

___D) Only by budding from plasma membrane

___E) Only by self-replication

14. In living cells there are

1. Ribosomes	**5. Introns**
2. ATP synthesis	**6. DNA polymerase**
3. Cell membrane	**7. Photosynthesis**
4. Nuclear envelope	**8. Mitochondria**

Which of them can exist <u>both</u> in prokaryotic <u>and</u> eukaryotic cells?

___A) 1, 2, 3, 6, 7 ___B) 1, 2, 3, 5, 7, 8 ___C) 1, 2, 3, 4, 7

___D) 1, 3, 5, 6 ___E) 2, 3, 7, 8

15. Specific inhibitor "X" of F_0F_1ATPase is added to a rat liver cell carrying out the oxidation of glucose under aerobic conditions. Which of the following would <u>not</u> occur as a result of this inhibition?

___A) Mitochondrial ATP formation will stop

___B) The citric acid cycle will slow down because of insufficient NAD^+ regeneration

___C) The rate of glucose consumption will decrease

___D) Glycolysis will be accelerated

___E) Oxygen consumption will be halted

16. Agarose gel electrophoresis was applied to the DNA samples given below. What will be the order of migration from the well, at the completion of the electrophoresis?

I- F^+ bacterial plasmid

II- F ' bacterial plasmid

III- Hfr *E. coli* chromosomal DNA

IV- *E. coli* chromosomal DNA

___A) I, II, III, IV ___B) II, III, I, IV ___C) IV, III, II, I

___D) III, IV, II, I ___E) IV, I, III, II

17. If you observe two DNA samples X and Y (each containing 1200 base pairs) migrating at different rates in an agarose gel, what would your interpretation be ?

___A) The amount of adenines in sample X is greater

___B) The amount of guanines in sample Y is greater

___C) The percentage of agarose in the gel is greater than 0.8 %

___D) There are intercalating agents in the agarose gel

___E) Samples X and Y have different conformations

18. The enzyme phosphofructokinase;

I- It is the major regulatory enzyme in glycolysis

II- ATP is the substrate for the enzyme

III- ATP is the negative modulator of the enzyme

IV- Citrate activates the enzyme

Which of the following is the correct answer for the above statements concerning the enzyme phosphofructokinase?

___A) Only IV is correct ___B) Only I and III are correct

___C) Only I, II and III are correct ___D) Only II and IV are correct

___E) I, II, III and IV are correct

19. If oligomycin and 2,4-dinitrophenol are both added;to a suspension of mitochondria containing substrates, P_i (inorganic phosphate), Mg^{++} and ADP;

___A) Both O_2 consumption and ADP phosphorylation will cease

___B) The rate of O_2 consumption will increase but ADP phosphorylation will cease

___C) Phosphorylation/O_2 consumption ratio will remain the same

___D) Phosphorylation/O_2 consumption ratio will increase

___E) O_2 consumption will decrease but ADP phosphorylation will continue

20. In anaerobic glycolysis 2 moles of inorganic phosphate (P_i) are used for one mole of glucose consumed. Which of the following enzymes catalyzes the reaction in which P_i is directly consumed?

___A) Hexokinase

___B) Phosphofructokinase

___C) Pyruvate kinase

___D) Glyceraldehyde-3-phosphate dehydrogenase

___E) Enolase

21. Which of the following cannot use ketone bodies for the generation of energy?

___A) The brain (in fasting)

___B) The heart muscle

___C) Erythrocytes

___D) The kidney cortex

___E) The skeletal muscle

22. Inside the choloplast the potential uses for the G3P (glyceraldehyde 3-phosphate) produced in the Calvin cycle include the synthesis of:

___A) Fatty acids

___B) Glycerol

___C) Glucose

___D) Amino acids

___E) All of the above

23. The following statements are about the effect of a competitive inhibitor in a reaction catalyzed by an enzyme.

I- V_{max} is unchanged

II- The inhibition can be reversed by increasing the concentration of the substrate

III- K_m increases

IV- The inhibitor binds to the enzyme at a different site than the active site

Which combination of statement(s) is/are true?

___A) I, II and III ___B) Only I and III ___C) Only II and IV

___D) Only IV ___E) I, II, III and IV

24. Which of the following bonds is <u>not</u> present in the structure of DNA?

___A) 3'-5' phosphodiester bond

___B) N-glycosidic bond

___C) H-bonds

___D) Hydrophobic interactions

___E) Disulphide bonds

25. Consider these two relationships and the four statements about the aminoacids/proteins and fatty acids/triglycerides

Left	Right	Left	Right
Amino acids:	Proteins	Fatty acids:	Triglycerides

I. Both molecules on the right consist only of repeated units of the molecules on the left

II. In the process of synthesis of both molecules on the right, at least some electrical charges are neutralized

III. In both relationships, the diversity in the molecules on the left result in the diversity in the molecules on the right

IV. In the synthesis of both molecules on the right, water is released

Which of the statement(s) is/are correct?

___A) I, II, III, and IV ___B) II, III and IV ___C) III and IV

___D) Only III ___E) Only IV

26. Five different cell cultures were treated with different radioactively labelled compounds as follows:

Compound	Cell Culture
Lactose	Cell culture a
Valine	Cell culture b
Thymidine triphosphate	Cell culture c
Glutamic acid	Cell culture d
Alanine	Cell culture e

After an hour the cells were washed, fixed and autoradiographed. In order to study nuclear activities *in vivo* which of the cell cultures is the best?

___A) Cell culture a ___B) Cell culture b ___C) Cell culture c
___D) Cell culture d ___E) Cell culture e

27. Which of the molecules is responsible for the autocatalytic excision of introns and splicing of exons in eukaryotic cells?

___A) RNA polymerase

___B) Ribonuclease

___C) Ribozyme

___D) Reverse transcriptase

___E) Endonuclease

28. The interaction between the anticodon of a tRNA molecule and the complementary codon of mRNA is achieved by:

___A) The catalysis by peptidyl transferase

___B) ATP energy

___C) The catalysis by amino-acyl-tRNA synthetase

___D) The covalent bonds formed with energy from GTP

___E) H-bonds

29. The lac (lactose) operon is an example of:

___A) Translational control

___B) Posttranslational control

___C) Replication control

___D) Transcriptional control

___E) All of the above

30. The breakdown of glucose in the cell is controlled by the activation or inactivation of enzymes present in the specific stages of glycolysis and the citric acid cycle. There are three key enzymes like this. The conditions that activate or inactivate these enzymes are given in the table below. Which combination is correct for the activation of all the three enzymes?

	ENZYMES		
	Phosphofructokinase	Citrate synthase	Isocitrate dehydrogenase
___A)	High level of ADP+ AMP	Low level of ATP+NADH	Low level of ATP+NADH
___B)	High level of ATP	High level of ATP+NADH	Low level of ATP+NADH
___C)	Low level of ATP	High level of ATP+NADH	Low level of ATP+NADH
___D)	High level of ADP andAMP	High level of ATP+NADH	High level of eitherADP or NAD^+
___E)	High level of ATP	Low level of either ATP or NADH	High level of either ATP or NAD^+

31. Which of the following statements is <u>false</u> about prokaryotic RNA polymerase?

___A) The synthesis is in the 5'-3' direction

___B) There is only one RNA polymerase enzyme responsible for the synthesis of rRNA, m-RNA and t-RNA

___C) Its RNA product will hybridize with the DNA template

___D) The transcription starts from the AUG codon in the DNA

___E) The enzyme synthesizes a single transcript that codes for several polypeptide chains

32. Which of the following statement about the regulator gene in bacterial operon model is true?

___A) It codes for repressor protein

___B) It codes for inducer molecules

___C) It is the binding site of RNA polymerase

___D) It is the binding site of inducer molecules

___E) Provides the transcription or inhibition of transcription of the structural genes

33. Which of the following statements is <u>false</u> regarding to the procaryotic mRNA?

___A) It is polycistronic

___B) It does not involve introns

___C) It binds to ribosome from the 5'end.

___D) It is synthesized in the nucleus

___E) It can form a single transcript that codes for several polypeptides.

34. Which of the following statements is a <u>false</u> description for a codon?

___A) It consists of three nucleotides

___B) It is the basic unit of the genetic code

___C) There may be more than one codon for the same amino acid

___D) It is located on the t-RNA

___E) It can never code more than one amino acid

GENETICS AND EVOLUTION

35. A cross was made between two albinos and phenotypically identical F_1 generation was obtained. When F_1 was self-crossed, F_2 was observed as 9 normal and 7 albinos. Which of the following combinations suits this kind of inheritance?

	Parents	Offsprings(F_2)			
___A)	AAbb X aaBB	9A-B-	3aaB-	3A-bb	1aabb
___B)	aabb X AAbb	9A-B-	3aaBb	3Aabb	1aabb
___C)	AaBb X AaBb	9A-B-	3aaBb	3Aabb	1aabb
___D)	aaBb X Aabb	9A-B-	3aaB-	3A-bb	1aabb
___E)	AABB X aabb	9A-B-	3aaB-	3Aabb	1aabb

36. In an experimental population, the frequency of the O blood type is 25%, A is 24%, B is 39% and AB is 12%. Which of the following is the frequency of the alleles which are responsible for the blood types A, B and O?

	A	B	O
___A)	0.3	0.2	0.5
___B)	0.2	0.5	0.3
___C)	0.2	0.3	0.5
___D)	0.5	0.2	0.3
___E)	0.3	0.5	0.2

37. Deleted

38. Incomplete penetrance, sex-limited traits, sex-influenced traits, age-influenced traits and temperature-influenced traits are all examples of

___A) Linkage ___B) Conditional gene expression

___C) Epistasis ___D) Multiple alleles ___E) Partial dominance

39. Deleted

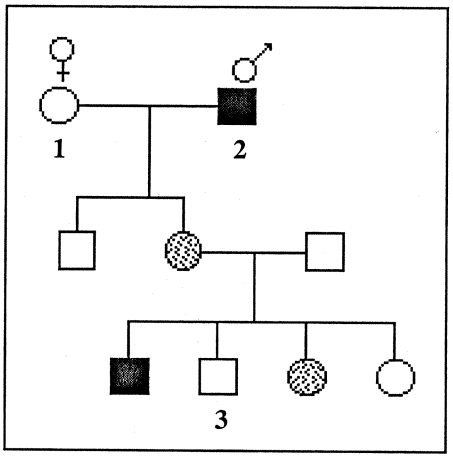
40. The fruit weights of a squash plant vary between 2 and 4 kg. The fruit weights are a product of pairs of additive polygenic genes. Which of the following is true for the F2 generation that resulted from a 2 kg squash being pollinated with a 4 kg one in terms of the number of individuals of any weight classes and also regarding the genotypes of the pollinated 2 kg and 4 kg squashes.

	4 kg	3.5 kg	3 kg	2.5 kg	2 kg	2 kg parent	4 kg parent
__A)	1	2	6	2	1	aabb	AABB
__B)	1	4	6	4	1	AaBb	aaBB
__C)	1	4	6	4	1	AAbb	aaBB
__D)	1	6	2	6	1	AABb	AABB
__E)	1	4	6	4	1	aabb	AABB

41. Which of the following is <u>not</u> a reason why recessive alleles are not observed in the phenotypes of heterozygotes?

___A) The recessive allele codes for a nonfunctioning protein
___B) The recessive allele is linked to the dominant allele
___C) The dominant allele produces so much product as to "swamp" the product of the recessive allele
___D) The recessive allele is normal, but the product of the dominant allele inhibits the function of the recessive allele
___E) The allele's product (e.g.an enzyme) is much less functional and therefore masked by the dominant allele's product

42.



Healthy : Empty Sick : Dark colored Carrier : Spotted

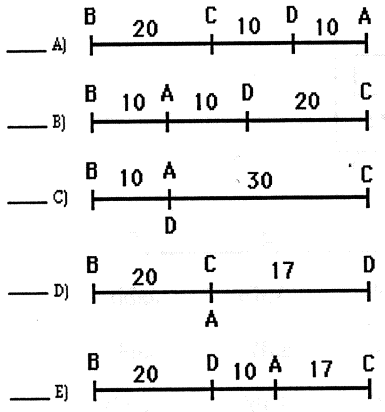
On the pedigree (family tree) given above which of the following would be the genotype of the individuals written as 1, 2 and 3?

	1	**2**	**3**
___A)	AA XX	a XY	A XY
___B)	Aa	Aa	aa
___C)	aa XX	A XY	A XY
___D)	aa	Aa	aa
___E)	Aa	AA	aa

43. An individual of the genotype AaBbCcDd was crossed with the one aabbccdd and the following results were obtained.

aBCD	42
Abcd	43
ABCd	140
abcD	145
aBcD	6
AbCd	9
ABcd	305
abCD	310

Which of the following shows the arrangement of the genes and their distance (in centimorgans)?



44. Genetic variations are important for populations

___A) So that males and females of parthenogenetic species might be distinguished

___B) So that evolution is directed

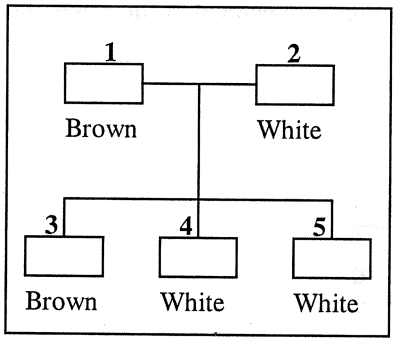
___C) Because they provide the raw material on which selection acts

___D) So that organisms might be classified

___E) To make them more interesting to study

45. When a dominant allele (A) is alone, it causes a brown fur color but when it is with another allel which has an epistatic effect, the fur color is white.

According to this, which of the following shows the true genotypes of the individuals in the family tree given above?



	1	2	3	4	5
___A)	Aabb	AaBb	Aabb	AaBb	aabb
___B)	AaBb	aabb	AaBb	aaBb	aabb
___C)	AaBb	aaBb	AaBb	Aabb	Aabb
___D)	AaBb	aabb	AaBb	aaBb	aabb
___E)	aaBb	AaBb	Aabb	aaBb	aabb

46. Deleted

47.

	Phenotypes of the individuals	
Genotypes	Female	Male
AA	Δ	Δ
Aa	Δ	Δ
aa	Δ	Ø

An inheritance scheme of any character is given above. Which of the following is true for the inheritance type of this character?

___A) This character is sex linked

___B) This character is sex limited

___C) This character is sex influenced

___D) Incomplete penetrance is seen in the inheritance of this character

___E) Codominance is seen in the inheritance of this character

48. In cattle, the polled (hornless) condition is dominant to the horned condition. Coat colour can be red, white or roan (red with white patches). Both genes are carried on autosomes and they are not linked. A cross was carried out between a cow and a bull, both of which had the roan coat colour and both were heterozygous for the polled condition. Which of the following statements are true about the offspring from the cross, assuming that the cross was carried out several times to produce a lot of offspring?

1. **The chance of producing white polled and white horned offspring is the same.**
2. **The chance of producing roan polled offspring is three times that of producing roan horned.**
3. **There is an equal chance of producing red polled and white polled offspring.**
4. **Statistically there should be more roan horned offspring than any other type.**
5. **The chance of producing roan polled offspring is twice that of producing white polled.**

___A) 1 & 2

___B) 2 & 3

___C) 3 & 4

___D) 1, 2 & 3

___E) 2, 3 & 5

49. In guinea-pigs, there are several alleles involved in determining the animal's coat color. C^b - black; C^c - creamy; C^s - silver and C^z - albino. Analyze the results of the following crosses and determine the most suitable order of alleles referring to dominance-recessiveness relationships of these alleles.

Crosses	Phenotype of parents	Phenotype of offspring			
		Black	Silver	Creamy	Albino
1	black x black	22	0	0	7
2	black x albino	10	9	0	0
3	creamy x creamy	0	0	30	11
4	silver x creamy	0	23	11	12

___A) $C^b > C^c > C^s > C^z$

___B) $C^b > C^s > C^c > C^z$

___C) $C^c > C^z > C^b > C^s$

___D) $C^b > C^z > C^s > C^c$

___E) $C^b > C^c > C^z > C^s$

50. Deleted

51. Which of the following is <u>not</u> a proof that eukaryotic cells evolved by endosymbiosis?

___A) Similarity between spirochetes and flagellum

___B) Similarity between mitochondrial DNA and procaryotic DNA

___C) Similarity between bacterial and chloroplastic ribosomes

___D) Similarity between chloroplast and cyanobacteria

___E) Similarity of the inhibition of the protein synthesis between the eucaryotic cells and the mitochondria

52. Which of the following has the best evolutionary adaptation capacity?

___A) Primitive, heterogenous heredity material, high number of generation, short life span

___B) Highly specific, homogenous heredity material , high number of generation, long life span

___C) Highly specific feeding regime, living underground, asexual reproduction

___D) Living on high mountains, nocturnal, feeding on the most common plants

___E) Highly tolerant to hereditary changes, low offspring success, specific feeding regime

53. Which of the following is <u>not</u> a biological characteristic of desert organisms?

___A) No regular reproductive cycle

___B) Seeds germinate immediately after flowering and fruiting

___C) Fewer stoma (in plant)

___D) Specialized kidney capable of reabsorbing water (in animal)

___E) More succulent plants

54. Deleted

55. Biologists assume that the first heredity material to appear was RNA. Which of the following may be the main reason for that?

___A) RNA was produced in Miller's experiment

___B) RNA is structurally more primitive than DNA

___C) The RNA called ribozyme catalyses some chemical reactions

___D) DNA can not stay stable in hydrophobic medium

___E) RNA appears in all animals

56. Which of the following is <u>not</u> evidence that higher plants are derived from green algae?

___A) Some green algae have multicellular sporophyte and gametophyte phases

___B) Both plants and algae have cellulose in their cell walls

___C) Both plants and algae have similar photosynthetic and accessory pigments

___D) Both plants and algae synthesize starch as a main store product

___E) Green algae and higher plants have the same amount of DNA per cell

57. The statements below are about various pollination strategies in plants. Which one could be the most disadvantageous for evolutionof new species?

___A) The stigma can recognize the origin of pollen grains, and does not accept those from the same flower

___B) The stigma never emerges from the corolla, and only accepts pollen grains from the same flower

___C) The corolla forms a long tube, only allowing some specialized pollinators which carry pollen grains from the same species to enter

___D) The stamens and pistil mature at different times

___E) The stamens and pistil are located in different flowers

58. Which of the following triplets is <u>false</u> for the hearing organ?

	Structure	Animal	Function
___A)	Columella	Lizard	Transports the sound from the membrane to the cochlea
___B)	Weber bones	Fish	Transports the sound created by the vibration of the swim bladder to the brain
___C)	Tarsal bones	Salamander	Transports the vibrations from the soil to the inner ear
___D)	Some cranial	Whale	Transports the sound from water to the (otic) bones inner ear
___E)	Utricle (saccule)	Mole	Transports the vibrations from the soil to the inner ear

59. Deleted

PLANT ANATOMY AND PHYSIOLOGY

60. Which of the following can <u>not</u> be stated relating to cyclic photophosphorylation?

Note: $NADP_{red}$ = NADPH; $NADP_{ox}$ = $NADP^+$

___A) It is favored when the cell is more in need of ATP than $NADP_{red}$

___B) It is favored when $NADP_{ox}$ is in short supply

___C) An energized electron is first accepted by ferredoxin

___D) Plastocyanin is the last acceptor of an energized electron before it reaches the center

___E) In the system, cytochrome "f" connects ferredoxin to plastoquinone

61. Deleted

62.

I. It is required for activity of some dehydrogenases, decarboxylases, kinases, oxidases and peroxidases

II. Under its deficiency, plant tissues become soft and often flaccid even under low temperature and stress conditions

III. It is required for the photosynthetic reactions involved in the 0_2 cycle

Which of the following gives the best match of minerals to thestatements above?

	I	II	III
___A)	N	Ca	Mg
___B)	S	Mn	Mg
___C)	Mn	N	P
___D)	Mn	Ca	Cl
___E)	Cl	K	P

63. When the temperature is high and the amount of dissolved oxygen is higher than that of CO_2 in the chloroplasts, in which of the following plants does growth <u>not</u> slow down?

___A) Wheat

___B) Watermelon

___C) Sunflower

___D) Sugar cane

___E) Rice

64. Deleted

65. Deleted

66. Deleted

67. Deleted

68. Which of the following <u>cannot</u> be referred to as blue-light responses in higher plants and fungi?

___A) Phototropism in *Phycomyces*

___B) Carotenoid biosynthesis in *Neurospora*

___C) Stomatal opening in higher plants

___D) Chloroplast rearrangements

___E) Flavenoid synthesis

69. "Shooty"tumors are produced in the stem of an "X" plant infected by bacteria in which mutations occur in their T-DNA, while "rooty" tumors are formed in the stem of a "Y" plant. Which of the following is true for the effects mentioned above.

___A) In the "X" plant, the genes which are responsible for giberellin (giberellic acid(synthesis are inactivated while in the "Y" plant, genes which are responsible for abscisic acid synthesis are inactivated.

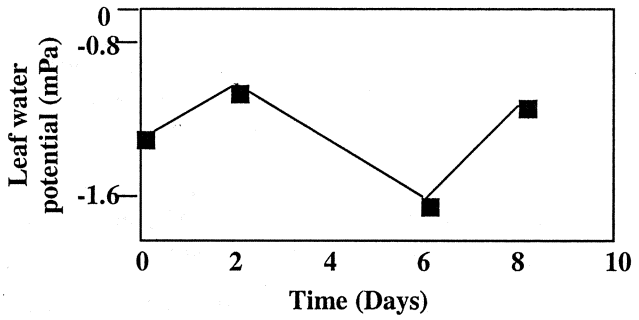
___B) In the "X" plant, the genes which are responsible for Indol acetic-acid synthesis are inactivated while in the "Y" plant, genes which are responsible for zeatin synthesis are inactivated.

___C) In the "X" plant, the genes which are responsible for zeatin synthesis are inactivated while in the "Y" plant, genes which are responsible for ethylene synthesis are inactivated.

___D) In the "X" plant, the genes which are responsible for abscisic acid synthesis are inactivated while in the "Y" plant, genes which are responsible ethylene synthesis are inactivated.

___E) In the "X" plant, the genes which are responsible for cytokinins synthesis are inactivated while in the "Y" plant, genes which are responsible for ethylene synthesis are inactivated.

70. In the figure, changes in water potential in the leaves of a plant over a period of time are shown. Which of the following is true according to this situation?



___A) The ABA (Abscissic acid) content decreased, and stomata resistance increased between the 2nd and 6th days; the process was reversed between the 6th and 8th days

___B) The ABA content did not change and stomata resistance decreased between the 2nd and 6th days; the process was reversed between the 6th and 8th days

___C) The ABA content increased and stomata resistance decreased between the 2nd and 6th days; the process was reversed between the 6th and 8th days

___D) The ABA content and stomata resistance increased between the 2nd and 6th days; the process was reversed between the 6th and 8th days.

___E) The ABA content decreased and stomata conductance increased between the 2nd and 6th days; the process was reversed between the 6th and 8th days.

71. Which of the following are limiting or near-limiting nutrients both in aquatic and terrestrial systems?

___A) Nitrogen-potassium ___B) Potassium-magnesium

___C) Phosphorus-nitrogen ___D) Calcium-magnesium

___E) Iodine-magnesium

72. Which of the following is <u>not</u> true for the auxin transport in plants?

___A) IAA transport usually does not take place in sieve tubes and xylem

___B) IAA transport usually occurs in parenchymatic cells adjacent to vascular bundles

___C) Auxin moves rather slowly within the plant

___D) IAA moves mainly from the apex to the base (basipetal direction)

___E) Auxin transport does not require energy

73. Light is perceived by all living organisms in one way or the other. The pigment which is chosen for this process of photoperception are carotenoids. Which of the following properties make carotenoids the right pigment for this function.

___A) Their ability to absorb most of the visible and ultraviolet light

___B) Their high capacity to store and transfer light energy as chemical energy

___C) As saturated organic compounds, their capability to preserve themselves against environmental factors such as high energy currents

___D) Their high affinity for proteins which have a role in perception

___E) The efficiency of long structures of alternating double bonds in their structure to initiate light sensitive stereoisomerism

74. The changes that take place in climacteric fruits when they ripen (colour, texture and chemical composition) are mainly due to:

___A) The CO_2 content in the atmosphere

___B) The temperature variation

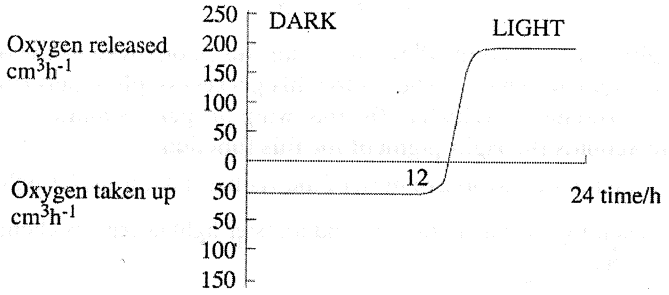
___C) The ethylene synthesis in the fruit

___D) The auxin concentration in the fruit

___E) Giberellin concentration in fruit

75. Deleted

76. The data were obtained relating to the rates of oxygen release and uptake in plants. The plants were placed in the dark for 12 hours followed by 12 hours in light. The temperature was constant throughout the experiment. The results are shown in the graph.



Which of the following is the most accurate estimate of the total volume of oxygen used by the plants for respiration during 24 hours of the experimental time?

___A) 50 cm^3 ___B) 600 cm^3 ___C) 1000 cm^3

___D) 1200 cm^3 ___E) 1800 cm^3

77. In which aspect does C_4 photosynthesis differ from Crassulacean acid metabolism (CAM)?

___A) PEP carboxylase is only used in C_4 photosynthesis

___B) CO_2 fixation in CAM plants occurs at night while it occurs in C_4 plants during the day time

___C) Organic acids with four carbons are only produced in C_4 photosynthesis

___D) Only plants with crassulacean acid metabolism can carry out photosynthesis in arid environments

___E) Only plants with C_4 photosynthesis can economize water

78. Which of the following <u>cannot</u> be stated with relation to the shoot apex?

___A) There is only one apical cell in vascular non-flowering plants

___B) There is more than one apical cell in each cell layer in gymnosperms

___C) There are different apical cells in more than one tissue layer in angiosperms

___D) An apical cell is pyramidal shaped in non-flowering plants

___E) A shoot apex with a distinct tunica and corpus is found in gymnosperms

79. Which of the following <u>cannot</u> be stated for the collenchyma?

___A) It is a living tissue found in developing organs

___B) It is formed in the roots only under the effect of light

___C) Its location in petiols is peripheral

___D) It is located at the periphery of woody stems

___E) It is located at the periphery of lamina

80. Which of the following cannot be referred to as a function of the sporoderm (exine)layer of pollens?

___A) The storage of enzyme proteins for the reactions

___B) Playing a role in the reaction between pollen and stigma

___C) Production of the pollen tube

___D) Protection of pollen against external factors

___E) Realizing pollination

81. Deleted

82. In a flower, flower symmetry is radial, calyx 4 and fused, corolla 4 and is separate, the androecium has 5 stamens and is connected to the corolla, the gynoecium is compound in 5 parts, superior and syncarpous. According to the description given above, which of the formulae in the following is correct?

___A) + $K_{(4)}$ $[C_4A_{(5)}]\underline{G_{(5)}}$

___B) + $K_{(4)}$ $C_4A_{(5)}G_{(5)}$

___C) $^*K_4$ $C_4A_5\underline{G_5}$

___D) $^*K_{(4)}$ $[C_4A_{(5)}]\underline{G_{(5)}}$

___E) $^*K_4$ $[C_4A_5]\underline{G_5}$

83. Which of the following is true for a C_4 plant in which some leaves can carry out C_3 photosynthesis while others can carry out C4 photosynthesis?

___A) In fact, it is a C_3 plant

___B) The leaves which carry out C_3 photosynthesis lack Kranz anatomy

___C) PEP (phosphoenolpyruvate) is not synthesized in the leaves which carry out C_4 photosynthesis

___D) It indicates that the C_4 pathway was evolved from the C_3 pathway

___E) Both C_3 and C_4 photosynthesis do not occur on the same leaf

84. Deleted

BIOSYSTEMATICS

85. Deleted

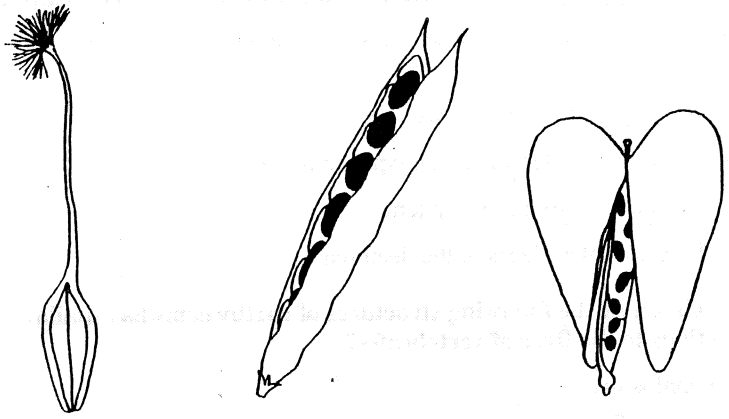
86.

I. A small dry single-seeded, indehiscent fruit

II. A fruit with a single ovary consisting of a single carpel

III. Dehiscent fruit is formed by two carpels with a septum between the carpels and its length is less than three times of its width

The above statements describe three different fruit types.



I **II** **III**

Which of the following combinations are correct for the fruit types?

	I	II	II
___A)	Siliqua	Legume	Achene
___B)	Legume	Siliqua	Achene
___C)	Siliqua	Achene	Legume
___D)	Achene	Siliqua	Legume
___E)	Achene	Legume	Siliqua

87. Deleted

88. Deleted

89. Which one of the following is <u>not</u> a characteristic of a deuterostomian animal ?

___A) Radial cleavage during the embriyonic development

___B) Regulative development during the embriyonic period

___C) Enterocoelom

___D) Pharyngeal slits on the pharynx

___E) Original (evolutionary origin) bilateral symmetry

90. The <u>main reason</u> for echinoderms living only in the sea is because;

___A) They were adapted to be sessile so they do not have a great distribution

___B) They appear first in the seas

___C) They live in different habitat types in the sea

___D) They have no excretory system

___E) There are safer places in the deep sea

91. Which one of the following structures of earthworms has similar functions to the liver of vertebrates?

___A) Typhlosolis

___B) Coelomocytes

___C) Chloragogen cells

___D) Cells that line the inner surface of the small intestine

___E) Calcium gland cells

92. The metanephridia of annelids and molluscs are functionally and structurally similar to the vertebrate kidneys. During the formation of urine, filtration, reabsorption and secretion processes occur. Where does filtration occur in the nephridium of mussels?

___A) On the nephrostom in the nephridium

___B) On the cardiac wall and pericardial glands

___C) On the tubules that are connected to the nephrostom

___D) On the wall of the intestine

___E) On the gill capillaries

93. Which one of the following is not a characteristic of molluscs (Mollusca)?

___A) Mantle

___B) Radula

___C) Trochophore larva

___D) Spiral cleavage

___E) Regulative development

94. Deleted

ANIMAL ANATOMY AND PHYSIOLOGY

95. Deleted

96. Which of the following is an important feature of primitive aquatic life forms?

___A) Partially oxygenated blood

___B) An open circulation with no small blood vessels or capillaries

___C) Significantly decreased blood pressure

___D) Highly acidic blood

___E) Carriage of most of the O_2 in the the plasma

97.

I- Partial O_2 pressure

II- pH

III- Amount of 2,3-diphosphoglycerate

IV- Partial CO_2 pressure

V- Body temperature

The factors affecting the dissociation of O_2 from hemoglobin in the human circulatory system are given above. In which of the following alternatives does this dissociation occur <u>most easily</u>?

___A) I increases	III decreases	IV increases
___B) II increases	V decreases	III increases
___C) I decreases	IV increases	III increases
___D) V increases	IV decreases	I increases
___E) II decreases	III decreases	V decreases

98. A nerve-skeletal muscle isolated preparation is placed in a Ca^{2+} - free medium appropiate for its survival. If the nerve is electrically stimulated, which of the following events will occur?

___A) The muscle will not be stimulated

___B) The muscle will be stimulated but will not contract

___C) The muscle will be both stimulated and contract

___D) The muscle will not be stimulated, but even if it is, it will not contract

___E) The muscle may be stimulated, and may contract but it will not relax

99. Which of the following is <u>false</u> about the differences between the vertebrate skeletal muscles and smooth muscles?

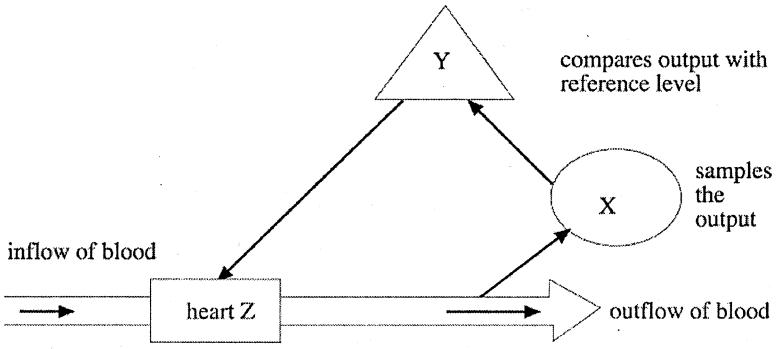
___A) Skeletal muscle is more sensitive to electrical stimulation while smooth muscle is more sensitive to chemical stimulation

___B) Skeletal muscle has a certain length in the resting state; smooth muscle has not

___C) Smooth muscle contracts more than skeletal muscle after stretching

___D) Skeletal muscle consumes 10% less of the energy than that of smooth muscle for the same degree of contraction

___E) Without a nerve connection, skeletal muscle cannot function normally but smooth muscle can



100. The figure shows a feedback system for the control of the output of blood from the heart (cardiac output). Which of the following gives the correct description of the parts played by the components X, Y and Z?

	X	Y	Z
___A)	Monitor	Receptor	Effector
___B)	Monitor	Effector	Receptor
___C)	Receptor	Monitor	Effector
___D)	Receptor	Effector	Monitor
___E)	Effector	Monitor	Receptor

101.

I- The magnitude of the impulse is dependent on the size of the stimulus

II- The number of fibres which are stimulated increases with the size of the stimulus

III- The speed at which the impulse travels increases with the size of the stimulus

IV- The speed at which the impulse travels depends on whether or not the nerve has a myelin sheath

V- The speed of the impulse conduction is directly proportional to the diameter of the axon

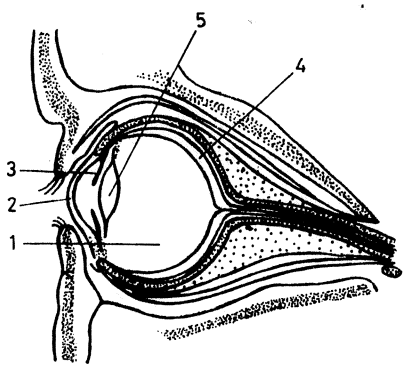
Which of the following is the correct combination of the statements given above about the nerve conduction?

___A) I, II and III ___B) II, III and IV ___C) II, IV, and V

___D) III, IV and V ___E) I, III and V

102. Deleted

103. The figure shows some parts of a mammalian eye numbered 1-5. If light suddenly strikes the eye, which of the following will be the nervous pathway for the evoked unconditional pupil reflex? (CNS= Central Nervous System)



___A) From 4 to the CNS and then to 3

___B) From 1 to 4 then to the CNS and then to 2

___C) From 3 to the CNS and back to 3

___D) From 5 to 1 then to 2

___E) From 4 to the CNS and then to 5

104. When an epinephrine (adrenalin)solution is dropped on the surface of a frog muscle(*M. gastrocnemius*) *in vitro*, the muscle displays a strong contraction. However,when the epinephrine solution is injected into the muscle cell, nothing happens. Which of the following is the reason for this?

___A) Epinephrine induced the antagonistic effect inside the cell

___B) Epinephrine induced the side-effect inside the cell

___C) Epinephrine was not processed by proteolytic enzyme

___D) Epinephrine did not find the receptor inside the cell

___E) Epinephrine was degraded inside the cell

105. Which of the following alternatives constitute the cell groups that function effectively in the human immune system?

___A) T lymphocyte – B lymphocyte – Macrophage

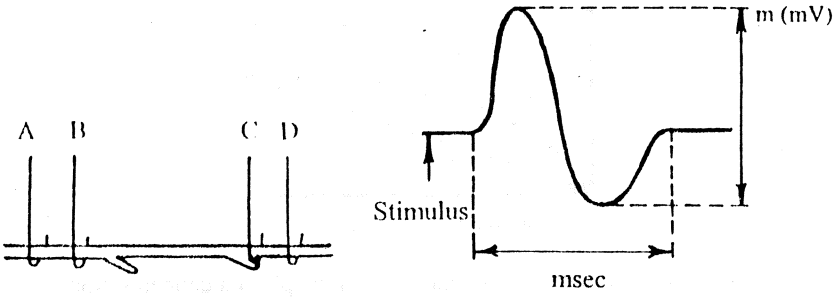
___B) T lymphocyte – Macrophage – Erythrocyte

___C) B lymphocyte – Kupffer cell – Lipocyte

___D) Dendritic cell – Neutrophilic leukocyte – Fibroblast

___E) Microglia – Histiocyte – Megakaryocyte

106. The left-hand diagram shows a frog sciatic nerve lying across a number of electrodes. The electrodes A and B are used for stimulating and C and D for recording. The right-hand diagram shows a typical recorded action potential. Based on this information, which of the following statements is correct?



___A) The duration of the recorded action potential (d) will be independent of the distance between electrodes C and D

___B) The magnitude of the recorded action potential (m) will be independent of the distance between electrodes C and D

___C) The first deflection on the recording occurs when electrode C is negative with respect to D

___D) The duration of the recorded action potential will depend on the distance between B and C

___E) The recorded action potential can be made monophasic by applying a local anesthetic at A

107. Deleted

108. Which one of the following is incorrectly matched?

___A) Bird – Discoidal cleavage – Erythrocyte with nucleus

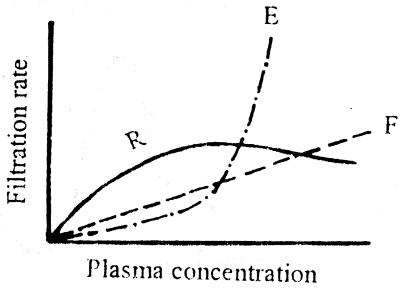
___B) Frog – Mesonephrose kidney – Holoblastic inequal cleavage

___C) Reptile – Viviparous organisms – Telolecithal egg

___D) Fish – Deuterostomia – Radial cleavage

___E) Mussel – Protostomia – Mosaic development

109. Diagram shows the rates of filtration (F), reabsorption (R) and excretion (E) of a substance (X) in relation to its plasma concentration by the kidneys. Which one of the following statement is incorrect?



___A) The reabsorption of X is dependent on its plasma concentration

___B) The filtration rate of X is directly proportional to its plasma concentration

___C) When the plasma concentration of X reaches a certain value, its excretion rate suddenly increases

___D) The concentration of X in the urine is expected to be higher than its amount filtered in the glomerulus

___E) The filtration rate of X in the glomerulus is fixed

110. Which of the following hormonal conditions of a woman is suitable in her late pregnancy?

___A) Estrogen increases, progesterone increases

___B) Estrogen decreases, progesterone decreases

___C) Estrogen increases, progesterone decreases

___D) Estrogen decreases, progesterone increases

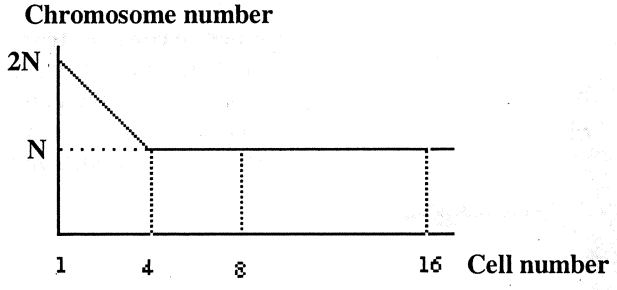
___E) Luteinizing Hormone increases, Human Chorionic Gonadotropin increases

111. Deleted

112. Deleted

113. Deleted

114.



Which of the following can be said according to the graph given above?

I Gamete formation in human

II- Gamete formation in phanerogamia

III- Gamete formation in queen honey bee and the development of the male bee

IV- Spore formation and development in ferns

___A) I and II ___B) III and IV ___C) II and IV

___D) I, II and IV ___E) I, II and III

115. Which one of the following is true about determination (developmental fate of cells)?

___A) Differentiation occurs before determination

___B) In animals, the cells that appear after the first two division are determined

___C) A determined cell will keep its features wherever it is transported in the embryo

___D) When a cell is determined its structure (shape) will begin to change

___E) A determined cell has the same transcription model as a differentiated one

BEHAVIOUR

116. In the picture, a flying dummy (silhouette) of a bird is illustrated. If the dummy is moved over hatched chicks of a pheasant (*Phasianus colchicus*) from left to right (upper arrow) or from right to left (ie. moving backward) (lower arrow), the chicks will react as follows (mark the correct answer with an "X"):

I. In both cases the chicks will react to the silhouette by crouching

II. In both cases the chicks will not react at all

III. During the movement of the silhouette from left to right (upper arrow) the chicks will not react

IV. During the movement of the silhouette from right to left (lower arrow) the chicks will not react

V. During the movement of the silhouette from right to left (lower arrow) the chicks will react by crouching

VI. During the movement of the silhouette from left to the right (upper arrow) the chicks react by crouching

___A) Only I ___B) Only II ___C) III and V

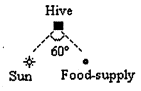
___D) IV and VI ___E) III and VI

117. "Animal aggression comes out in several cases and aggresion is also motivated by various conditions such as an external stimulus".

Which of the following is <u>not</u> an agressive behaviour?

___A) The behaviour of the prey that is under the threat of being killed
___B) Behaviour that does not reflect the normal behaviour and specifications of a group
___C) The behaviour against intruder in order to protect their territory
___D) Behaviour towards other animals that try to steal their own food
___E) Behaviour of a predator against its prey

118.

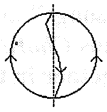


The location of the food-supply

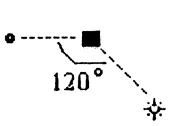
Tail-wagging dance

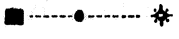
When honeybees find a food-supply, they can show the exact place of the supply to other individuals of the colony by a " tail-wagging dance". An example of this behaviour is illustrated above

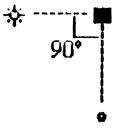
According to this example, for a honeybee that makes the illustrated tail-wagging dance below, which one of the following shows the location of the food-supply ?

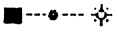


___A) 

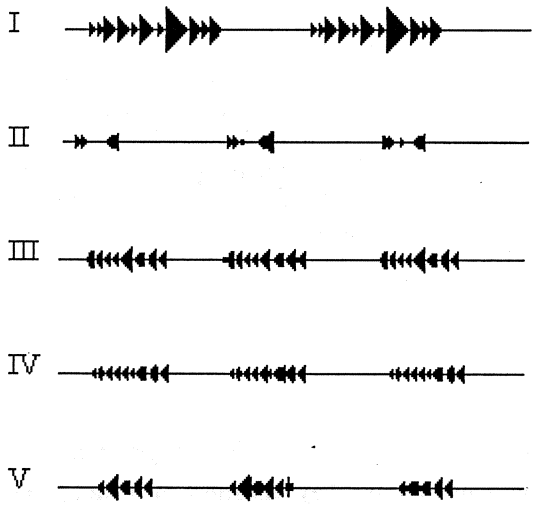
___B) 

___C) 

___D) 

___E) 

119.



It is known that some grasshopper species may make a sound in order to court the opposite sex and these sounds are species specific. It is also observed that these sounds seem very different when a close relative species live in the same area.

The sonograms of the "mating songs" of the five different species of male grasshoppers from the genus *Chorthippus* is given above. Which of the species (I-V) are living together in the same area?

___A) I and II

___B) III and IV

___C) III and V

___D) IV and V

___E) III, IV and V

120. "When a goose notices an egg outside her nest, she rises, extends her neck, touches the egg with her beak, and then rolls it back in very gently. She completes the same recovery behavior whether the objects she sees is a beer bottle or golf ball, even when the object is removed after she has begun to reach for it."

Which of the following statements is correct according to the situation above?

___A) The reason why the goose rolls back the objects that do not structurally look like an egg is her lack of recognition

___B) This behaviour is caused by instinct

___C) In order to fill her nest to provide suitable incubation conditions

___D) This behavior is learnt from the parents.

___E) The goose recognises her own egg shape. For this reason, egg rolling is a fixed action pattern and continues without another stimulus

ECOLOGY

121. Deleted

122. Which one of the following environmental conditions affects the dispersal trend of a population positively?

___A) The conditions that cause high mortality sometimes create empty habitats

___B) Very frequent disturbances in the habitat conditions

___C) Absence of suitable habitats very close to each other

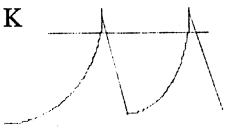
___D) A low level of natality causing the differences between the habitats

___E) A breakdown at any level of the food chain

123. Deleted

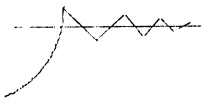
124. According to the population growth curves given below, which population has reached equilibrium by responding properly to negative feedback mechanisms with time?

___A) limit K

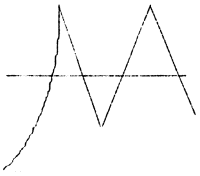


___B) limit K

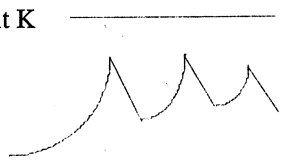
___C) limit K



___D) limit K



___E) limit K



125. Deleted

126. A mosquito species which lives in hot and highly humid environment generally chooses little isolated aquatic habitats to reproduce and completes its larval development. This species gives many generations by reproducing in late May and early October. To increase its population in a given area which in the following is the most important limiting factor for this species which is very sensitive to the chemical changes in the habitat water .

___A) Increase in the saturation deficit in the air during the reproductive season

___B) Predation

___C) Competition with another species in the microhabitat

___D) Increase in the shadow factor

___E) Increase in relative humidity

127. Which one of the following explanations cannot be given about the relationship between the carrying capacity and the environmental response of populations with a high density?

___A) Competition increases

___B) The natality (birth) rate decreases

___C) The negative feedback mechanism works

___D) The environmental response decreases

___E) The mortality rate increases

128. Deleted

129. Deleted.

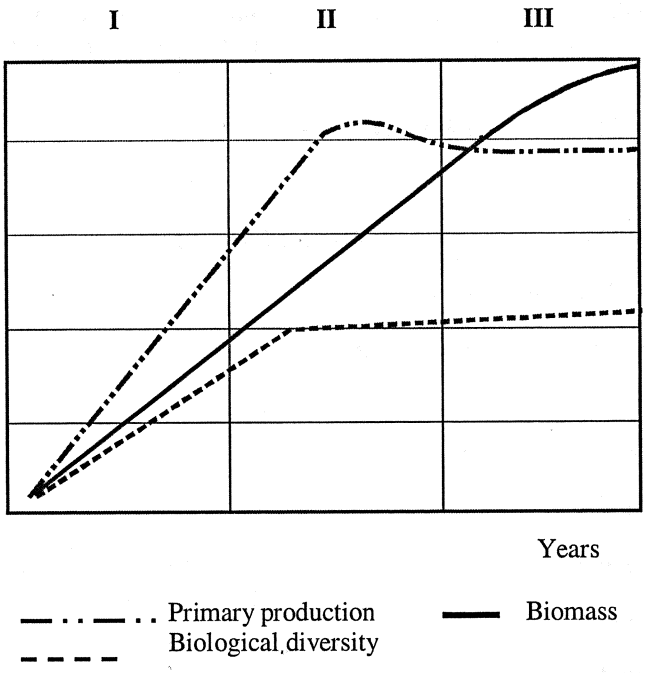
130. Deleted

131. Which one of the following cannot be said about the distribution of populations?

132. A park was built in a place that was occupied by a lot of species"A"trees. A long time ago they were all cut down no species ''A'' trees remained. Later gardeners planted more species "A" trees and also species "B" trees and species "C" trees had species B and C never grew in that region before. Nobody took care of this garden. After 100 years there were a lot of new "A" trees and "B" trees, but no young "C" trees . Which processes refer to the "A", "B" and "C" trees in that park?

	A	B	C
___A)	Introduced,	Acclimatized,	Reacclimatized
___B)	Acclimatized,	Introduced,	Reacclimatized
___C)	Introduced,	Reacclimatized,	Acclimatized
___D)	Reacclimatized,	Acclimatized,	Introduced
___E)	Acclimatized,	Reacclimatized,	Introduced

133. The graph represents the changes in the biomass, diversity and primary production in the ecological succession. Which blocks on the graph represent the first settler stages and the climax stage, respectively.



___A) I and II

___B) II and III

___C) I and III

___D) I, II and III

___E) None

134. An ecologist wants to investigate if there are any differences in the vegetation on the north and south facing sides of a valley. She lays down a rope from the top to the bottom of the slope and every 2 meters she places a 1 m^2 quadrat next to the rope. Standing above the quadrat she estimates and records the area occupied by each plant species. This technique involves which of the following?

1. The use of a point quadrat

2. The recording of % cover

3. The plotting of the results on a kite diagram

4. Random sampling

5. The use of a belt transect

___A) 1 & 2

___B) 2 & 3

___C) 3, 4 & 5

___D) 1, 2 & 3

___E) 2, 3 & 5

135. Deleted

4.3.2. Theoretical Test - Part B

CELL BIOLOGY

1. Deleted

2. Deleted

3. Deleted

4. In the left column below, you can see some proteins and in the right one there are some protein functions (1 – 8). Match the functions with the proteins by writing their numbers in the blanks. (A protein may have more than one function) (7 points).

___	Dynein	1. Shows channel protein characteristics
___	Na^+-K^+-	2. Possesses ATPase activity
___	Nexin	3. Fasciliates transport through membrane
___	Connexon	4. Transport protein
___	Porin	5. Ion transport protein
___	Keratin	6. Attaches the microtubules
___	Desmin	7. Attaches Z bands to the myofibers in muscle
		8. Exists in the cytoskeleton of epithel cells

5.

A) (5') A G C C T A A T G G C C T A (3')

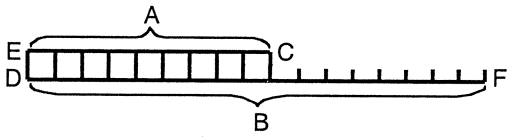
B) (3') T C G G A T T A C C G G A T (5')

The DNA above is replicated in the direction of the arrow. Write the appropriate letter showing the templates for leading strand and lagging strand synthesis in the blanks. (2 points)

template for the lagging strand _____

template for the leading strand _____

6.



A suitable substrate for DNA polymerase is shown above. Fill in each blank below with a corresponding letter on the diagram. (3 points).

Primer _____

Template _____

3' end of the primer _____

5' end of the primer _____

3' end of the template strand _____

5' end of the template strand _____

7. Two molecules of DNA (I and II) are the same size (1000 bp) but differ in base composition. The first one contains 42% and the second one 66% A+T. (1.5 points).

A) How many G residues are there in DNA I and II? (1 point).

I: _____

II: _____

B) Which molecule (I or II) has a higher T_m. (T_m =dissociation point) (0.5 point)

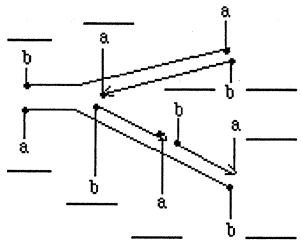
_____

8. Match the enzymes involved in the procaryotic replication at the left with their function at the right by putting the appropiate numbers in the blanks. (3 points).

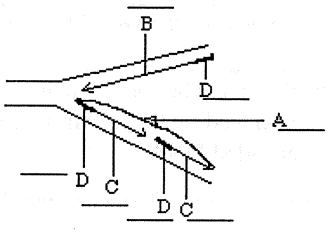
DNA Helicase_____	1. Synthesis of RNA primers in the replication of the lagging strand
Primase_____	2. Unbinds double stranded DNA
DNA polymerase I 3'→ 5' exonuclease activity_____	3. Removes RNA primers.
DNA Ligase_____	4. Seals nicks in the DNA at the boundaries between Okazaki fragments.
Topoisomerase II_____	5. Removes mismatched bases
DNA Polymerase I 5'→3' exonuclease activity_____	6. Releaves the topological stress produced by the unwinding of double stranded DNA.

9. Below is a diagram that shows DNA replication. On the diagram, mark: (5.4 points).

A) 3' ends with the letter "a" and 5' ends with the letter "b", (2 points).



B) The lagging strand with letter "A", the leading strand with letter "B" , Okazaki Fragments with letter "C", and RNA primers with letter "D". (1.4 points).



C) Match the enzymes with the reaction it catalyzes. Put the letter in front of the enzyme in the appropriate blanks below. (2 points).

E. Primase
F. Ligase
G. DNA Polymerase II
H. DNA Polymerase III
I. DNA Polymerase I

- Enzyme _____catalyzes the synthesis of fragment I
- Enzyme _____catalyzes the synthesis of fragment II
- Enzyme _____catalyzes the synthesis of RNA primer
- Enzyme _____seals the nick shown as III in the diagram

10. Compare RNA polymerase with DNA polymerase III that function in the transcription and replication processes in *E. coli* on the basis of the parameters (A-H) with their characteristics given in the table. Put the letters in the appropriate boxes. (5 points).

A) Promotor B) Origin C) 3'→5' D) 5'→3'

E) dNTP F) NTP G) Yes (+) H) No (-)

	RNA Polymerase	DNA Polymerase III
The DNA region initially recognized and bound by the polymerase		
The direction of the polymerization		
The direction of enzyme movement on the template strand		
The type of the nucleotide substrates added to the growing chain		
3'→5' exonuclease activity (Proof reading ability)		

11. Deleted

12. Deleted

13. For each of the following statements, indicate with a "P" if the statement applies only to prokaryotes, with an "E" if the statement applies only to eukaryotes, and with an "E-P" if the statement applies to both eukaryotes and prokaryotes. (2.7 points).

___ A single RNA polymerase transcribes genes that encode mRNA, tRNA and rRNA.
___ Polimerisation of DNA is in the 5`→ 3`direction.
___ Sigma (σ) subunit detaches from RNA polymerase shortly after transcription has initiated
___ The 5' end of the mature mRNA begins with a triphosphate
___ Polymerisation of RNA is in the 5`→ 3` direction
___ They carry circular DNA
___ There are no introns in mRNA

14. The template strand for mRNA is given below. (5 points).

(5') CTT TGA TAA GGA TAG CCC T*TC (3')

A) What is the base sequence of the mRNA that can be transcribed from this strand?

_____

B) Using the genetic code table given on the next page, write the amino acid sequence of the polypeptide coded by this mRNA.

_____

C) Suppose the other (complementary) strand is used as a template for the transcription. What is the amino acid sequence of the resulting peptide?

_____

D) If the labeled base above in the template strand is converted to "A" instead of "T", what would be the type of the mutation? Transition (X), transversion (Y), deletion (Z) or insertion (W) Write the correct letter on the line below.

_____

E) What is the type of this mutation? Neutral (N), silent (S), missense(M), or nonsense (NS)? Write the correct letter on the line below.

_____

BASE I	BASE II U		BASE II C		BASE II A		BASE II G		BASE II
U	UUU	phe	UCU	ser	UAU	tyr	UGU	cys	U
U	UUC	phe	UCC	ser	UAC	tyr	UGC	cys	C
U	UUA	leu	UCA	ser	UAA	stop	UGA	stop	A
U	UUG	leu	UCG	ser	UAG	stop	UGG	trp	G
C	CUU	leu	CCU	pro	CAU	his	CGU	arg	U
C	CUC	leu	CCC	pro	CAC	his	CGC	arg	C
C	CUA	leu	CCA	pro	CAA	gin	CGA	arg	A
C	CUG	leu	CCG	pro	CAG	gin	CGG	arg	G
A	AUU	ile	ACU	thr	AAU	asn	AGU	ser	U
A	AUC	ile	ACC	thr	AAC	asn	AGC	ser	C
A	AUA	ile	ACA	thr	AAA	lys	AGA	arg	A
A	AUG	met	ACG	thr	AAG	lys	AGG	arg	G
G	GUU	val	GCU	ala	GAU	asn	GGU	gly	U
G	GUC	val	GCC	ala	GAC	asp	GGC	gly	C
G	GUA	val	GCA	ala	GAA	glu	GGA	gly	A
G	GUG	val	GCG	ala	GAG	glu	GGG	gly	G

15. Deleted

16. Deleted

17.

A) The heart muscle while working aerobically

B) A bacterium culture that cannot grow in the dark

C) A propionic acid bacteria that can grow under anaerobic conditions in the dark

D) Erythrocytes

Fill in the blanks with the suitable letters above.(2 points)

_____ provides ATP requirement by photosynthesis

_____ provides ATP requirement by converting glucose to lactate

_____ provides ATP requirement by fermentation

_____ provides ATP requirement by oxidative phosphorylation

18. Atmospheric nitrogen (N_2) is chemically very stable. Only a few prokaryotic species can convert atmospheric nitrogen into usable form by plants. One of the characteristics of these organisms is that they possess the nitrogenase enzyme complex that can fix the nitrogen. O_2 irreversibly inhibits this enzyme. Considering that we live in an oxidizing environment, nitrogen fixing organisms must have a variety of mechanisms for protection from O_2.

A) Below are given some characteristics of bacteria. Put an " X " in the blank for the ones that can fix nitrogen. (4 points).

_____A free living bacterium under soil like Clostridium
_____Cyanobacteria like *Nostoc muscorum* possess thick cell walls
_____Bacteria like E.coli that are inhabitants of the intestinal tract
_____Symbiotic bacteria like Rhizobium of leguminous plants that possess specialized protein leghemoglobin
_____High mutation rate bacteria like Salmonella typhimurium

B) Which is the major product of the nitrogenase enzyme complex? (Mark with an "X")

_____ammonia _____nitrite _____nitrate _____nitrogen gas

GENETICS AND EVOLUTION

19. Consider cases of unknown paternity where the ABO blood group phenotype of concerned individuals is to be used to help identify fathers. The frequency of blood group allels in the population is as follows: p (A) = 0.2, p (B) = 0.3, p (O) = 0.5. Blood group assessments are made by routine laboratory procedures, which can assess blood group *phenotypes*. (4 points)

a. In a case where the mother`s blood group is A and the child`s blood group is AB, what is the probability that a man chosen at random from the population will be proven not to have fathered the child purely on the basis of his blood group. (2 points)

Answer:_____

b. In a case where the mother`s blood group is A and the child`s blood group is O, what is the probability that a man chosen randomly from the population will be proven not to have fathered the child purely on the basis of his blood group. (2 points)

Answer:_____

20. In a certain human population 64% is able to roll their tongue.

This ability is based on a dominant allele.

A roller marries a non-roller.

Calculate the chance of having a roller baby. (4 points)

Answer:_____%

21. Deleted

22. In peas, the allele for green seed color (A) is dominant over the allele for yellow seed color (a) and the allele for normal leaf (B) is dominant over the allele for rolled leaf (b). The F_1 generation is obtained by crossing AABB x aabb. When these F_1 plants are tested again, the following results are found;

117 green seed / normal leaf

115 yellow seed / rolled leaf

76 green seed / rolled leaf

80 yellow seed / normal leaf

$\chi^2 = \sum [(O-E)^2 / E]$

O: Observed value E: Expected value (6 points)

A) Degree of freedom: _____

B) Calculate the χ^2 value and check from the table: _____

C) According to the result of choice B, decide whether these genes are linked or not (mark with the letter "X")

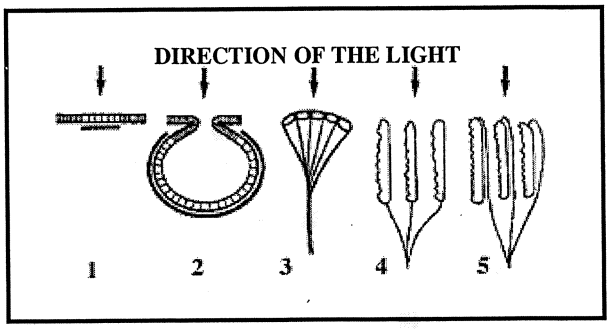
Genes are linked: _____

Genes are not linked: _____

D) If these genes are linked, calculate the distance between the genes

The distance between the genes is _____ map units

23. (2.5 points).



According to the structure and the location of the light sensors illustrated on the scheme above, match the followings

Animal group

_____Earthworm

_____Squid

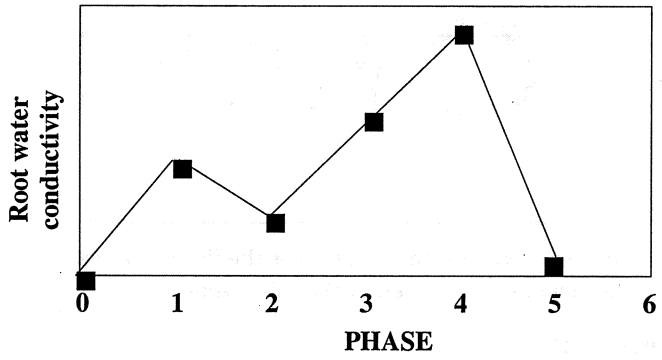
_____Human being

_____Insect

_____Planaria

PLANT ANATOMY AND PHYSIOLOGY

24. (2 points)



The graph represents the water conductivity of a root. Mark the true alternative(s) with an "X".

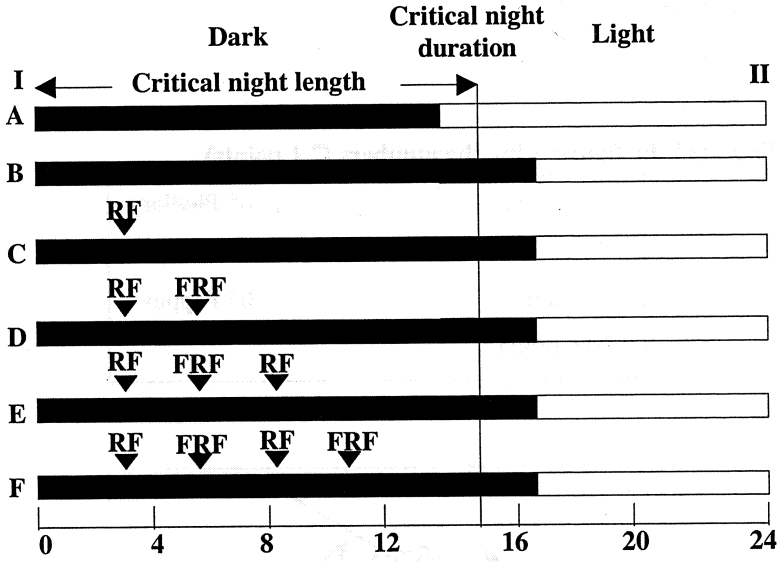
___A) The temperature decreases between the phases 1-2 and 4-5

___B) CN^- is added to the medium between the phases 0-1 and 2-4

___C) There is enough oxygen between the phases 1-2 and 4-5

___D) The root cannot get enough nutrient between the phases 1-2 and 4-5

25. (3.6 points)



RF : red or white flash **FRF: far red flash**

The figure represents exposure of long-day and short-day plants to a variety of light regimes. Decide whether long-day (short-night) and short-day (long-night) plants will flower (+) or not (-) under the conditions given above.

	Long day (short-night) plant	Short-day (long-night) plant
A)		
B)		
C)		
D)		
E)		
F)		

I **II**

26. Deleted

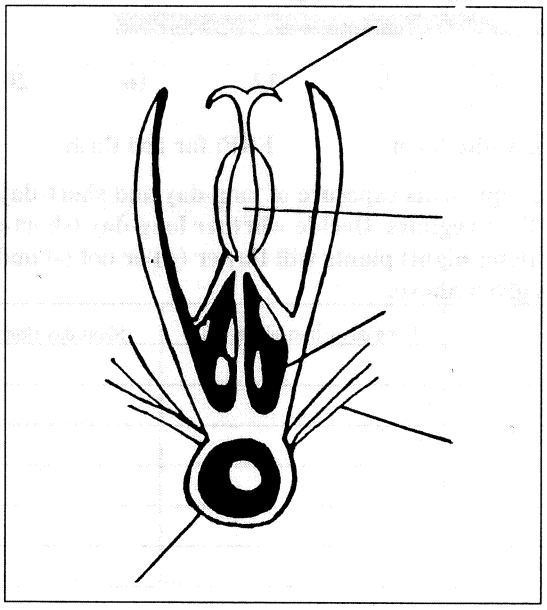
27. Deleted

28. Deleted

29. Deleted

30. Label the figure using the numbers (2.1 points)

01 Anther	05 ~~Phyllary~~
02 Ovarium	06 Nectar
03 Stigma	07 Pappus
04 Corolla	



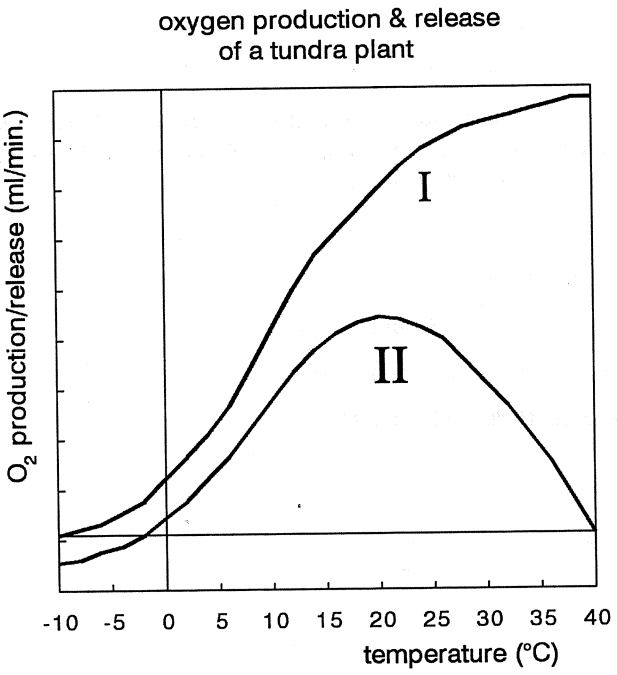
31. A student is studying a tundra plant at different temperatures.

He investigates:

The production of oxygen by means of photosynthesis, and

The net amount of oxygen released into the environment

The diagram shows the results. It is up to you to decide which curve is production and which curve is release. (2 points)



Now answer the following <u>two</u> questions:

31.1. At which temperature(s) are both the ATP-production and the ATP-consumption approximately equal? (1 point)

___A) At 20 °C

___B) At -2,5 °C and at +40 °C

___C) Only in between -10 °C and -2,5 °C

___D) Only in between -10 °C and + 10 °C

___E) In between -10 °C and + 40 °C

31.2. At which temperature(s) are the production of oxygen by photosynthesis and the consumption of oxygen by dissimilation equal to each other? (1 point)

___A) At 20 °C

___B) At -2,5 °C and at +40 °C

___C) Only in between -10 °C and -2,5 °C

___D) Only in between -10 °C and + 10 °C

___E) In between -10 °C and + 40 °C

32. Select numbers from the answer key and mark the parts of the different fruit types (3 points)

Answer key:

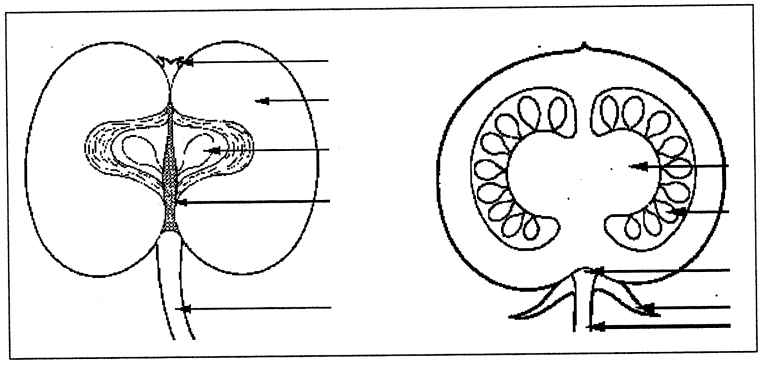
1- Remains of sepals

2- Receptacle

3- Seed

4- Placenta

5- Pedicel



33. Deleted

34. Deleted

35. Which of the following can be expected to happen when glucose is added to the mineral solution in which plant cells are bathed. Put a cross (X) in the related boxes.

35. 1. (1 point)

	Increases	Decreases
Membrane potential		
pH of the medium		

35. 2 (1 point)

	Taken up	Not taken up
Glucose		

BIOSYSTEMATICS

36. Deleted

37. Deleted

38. Which of the following descriptions about vertebrates is/are correct? Mark the correct ones with an "X". (2.5 points)

_____The scales of fish are epidermal scales
_____The scales of snakes are epidermal scales
_____The scales of lizards are epidermal scales
_____The scales of pangolins are epidermal scales
_____The hairs of humans are derivatives of epidermis
_____The horns of deers are epidermal in origin
_____The horns of cattles are epidermal in origin
_____The horns of rhinoceros are epidermal in origin

39. Deleted

40. Deleted

41. **I. Rhynia** **II. Spirogyra** **III. Rhizopus/Mucor**
IV. Lycopodium **V. Equisetum**

Establish the relationships between the given genera names above with the terms below (You can use any term more than once.) (3.6 points).

_____ It appeared in the Carboniferous period
_____ The sporangia are generally cluster shaped
_____ The zoospores never appear
_____ The oldest plant that has no leaves
_____ The first real roots are seen in this group
_____ The prothallus reaches sexual maturity in 12-15 year's time
_____ The chloroplasts are helozonic (spiral shaped)
_____ Xylem is made of ringed and spiral tracheids
_____ In the cross section, the xylem appears star or plate shaped

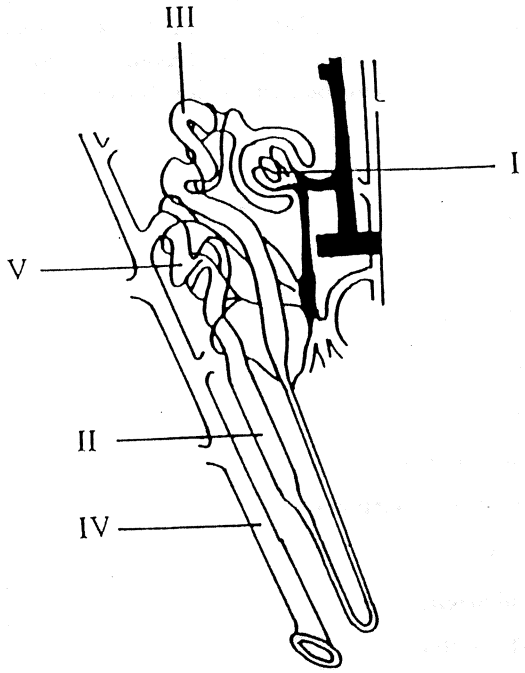
42. Deleted

ANIMAL ANATOMY AND PHYSIOLOGY

43. Some animals and some of their characteristics are shown in the table . Match these characteristics correctly with the given animals (mark the appropriate box with an "X") (3.6 points).

	Fresh water fish (carp)	Bird (pigeon)	Marine fish (sea bass)	Lizard (Chameleon)	Marine mammal (whale)	Terrestrial mammal (Mouse)
Drinks water regularly						
Does not drink water						
Wastes are discarded as ammonia						
Wastes are discarded as urea						
Wastes are discarded as uric acid						
Actively secretes salt						
Actively absorbs salt						
Excretes hipotonic urine relative to the body fluids						
Excretes isotonic urine relative to the body fluids						
Excretes hipertonic urine relative to the body fluids						

44.



In the figure, some parts of a mammalian nephron are numbered (I-V). Match these numbers with the events or properties given in the table (a number can be used more than once). (2.5 points).

Cl^- is actively pumped out	
Blood is filtered	
Almost all glucose is reabsorbed	
Urine becomes acidic	
Na^+ is reabsorbed under aldesterone control	

45. In humans, some mechanisms are activated in the case of a serious decrease in the red blood cell count. Some sources (organs/tissues), secreted substances, targets and biological responses are given in the list (1-13). Examine them and put appropriate numbers in the appropriate boxes in the table. (2 points).

1. Liver

2. Kidneys

3. Heart

4. Erythopoeitin

5. Lungs

6. Spleen

7. Bone marrow

8. Antidiuretic hormone

9. Renin

10. Androgens

11. Adrenaline

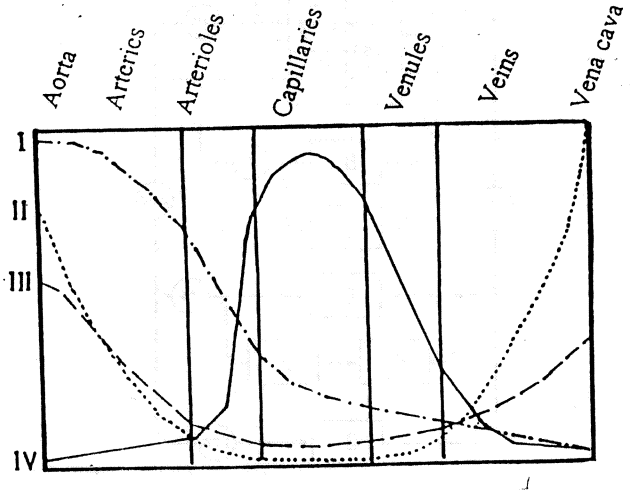
12. Increase in erythropoiesis

13. Increase in the blood glucose level

Stimulus	Stimulated organ/tissue	Secreted Substance	Target	Biological Response
Decreased red blood cell count				

46. Deleted

47. In the figure, 4 parameters varying according to the different parts of the human circulation system (aorta, arteries, arterioles, capillaries, venules, veins, and vena cava) are plotted (I-IV). Match the numbers of the curves with the parts of the circulation system (Put the appropriate number in front of each part.). (2 points).



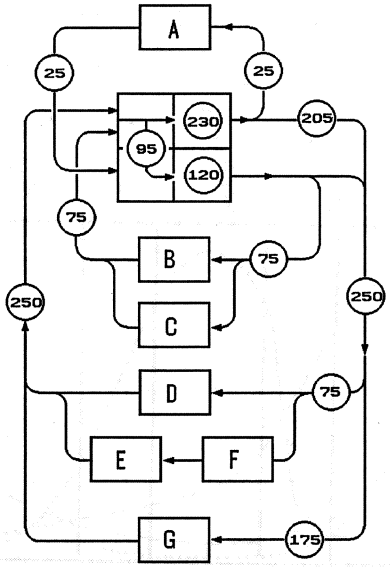
_____ Total cross-sectional area

_____ Blood pressure

_____ Blood velocity

_____ Vessel diameter

48. Inspect the following scheme representing the blood circulation of a human embryo just before birth. The numbers respresent the blood flow in ml/min per kg body mass of the embryo. (2 points).



48. 1. Indicate the letter of the box which represents the placenta. (1 point).

Answer:_____(fill in a letter)

48. 2. Calculate the ratio of blood flow through the lungs just before and few days after the birth, assuming that the total amount of blood leaving the heart at both are equal. (1 point).

Answer: (Ratio) Before / After =_____

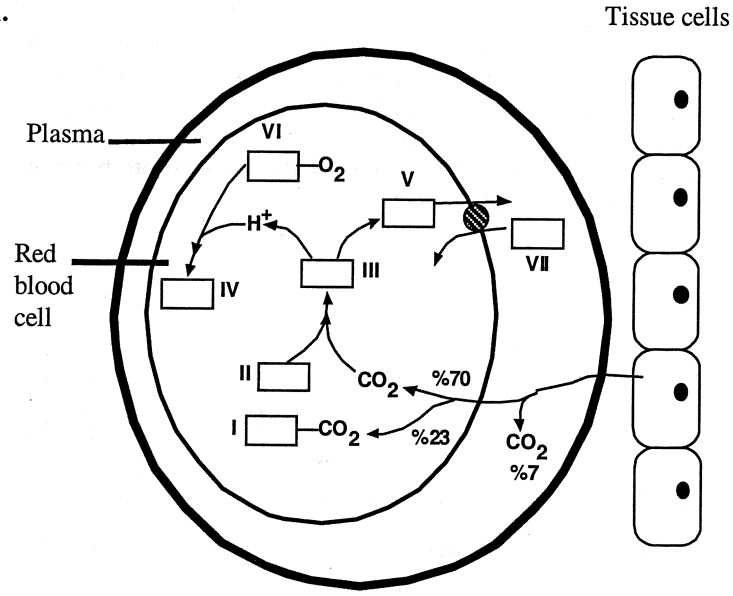
49. In the human circulation various mechanisms are activated when blood pressure decreases below or rises above its normal level. This question is related to a situation where the blood pressure exceeds its normal level. Indicate the events that take place at various parts of the circulation system to return the pressure back to its normal level by marking the appropriate boxes in the table with an "X" .(3 points).

Stretch receptors		Cardioaccelatory center		Cardioinhibitory center		Vasomotor center	
stimulated	inhibited	stimulated	inhibited	stimulated	inhibited	stimulated	inhibited

Cardiac output		Arterioles	
increases	decreases	constricted	dilated

50. Deleted

51.



The figure shows the reactions occuring during gas and electrolyte exchange between blood capillaries loaded with O_2 and the tissue cells. Fill in the empty boxes in the figure and below with the appropriate numbers out of the 13 substances given below. (3.5 points).

1. Hb (hemoglobin)	6. H_2PO_4	11. HCO_3
2. H_2CO_3	7. H_2SO_4	12. HbO_2
3. H_2O	8. Cl^-	13. HHb
4. CO_2	9. Na^+	
5. $NaHCO_3$	10. Ca^{2+}	

I	II	III	IV	V	VI	VII

52. The respiratory quotient RQ of an organism is defined as

RQ = CO_2 (produced)/O_2(used) .....(in a given time)

The theoretical RQ values of important substrates are approximately:

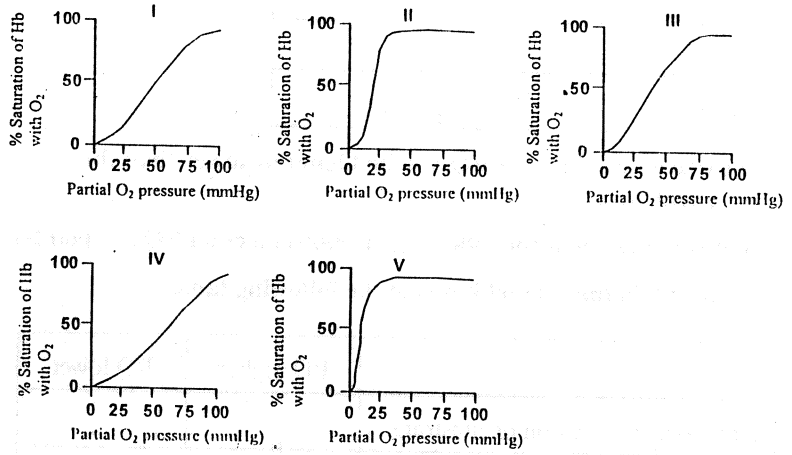
substrate (completely oxidised)	RQ
Carbohydrate	1,0
Fat	0,7
Protein	0,9

In practice, the values of RQ will be higher or lower than the theoretical ones.

What is the effect of the following circumstances on RQ? (2 points).

Put an "X" in the correct boxes in the following table.

	RQ higher	RQ lower
Anaerobic respiration of substrate		
Incomplete oxidation of substrate		
Fixation of CO_2 as $CaCO_3$		
Converting carbohydrate into fat		



53. Figure shows 5 saturation curves of O_2 with hemoglobin each obtained from a different animal (I-V). The shape of these curves differ according to the basal metabolism of the animal. Match these curves with the animals given below (Put the number of the curve in front of the name of the animal.) (2.5 points).

_____ Elephant _____ Snake _____ Bird (sparrow)

_____ Man _____ Mouse

54. Mark the correct change in the arterial chemoreceptors, respiratory rate, H^+ excretion rate in the kidneys and blood partial CO_2 pressure that takes place in order to correct a <u>drop</u> in blood pH. (2 points).

Arterial chemoreceptors		Respiratory rate	
stimulation	inhibition	increase	decrease

H^+ excretion in the kidneys		Blood partial CO_2 pressure	
increase	decrease	increase	decrease

55. Write the numbers which refer to the extra-embryonic membranes amnion (1), allantois (2), yolk-sac (3) and chorion (4) that are seen during the development of organisms given below. (1.4 points)

Fish _____

Frog _____

Reptile _____

Bird _____

Mammal _____

56. The following statements are about calcium and its regulation in humans. Match correctly the substances given in the answer key with the statements (put the letter of the substance in front of the statements). (2 points).

_____It is the vitamin which promotes the accumulation of calcium in the body

_____It is the gland which secretes calcitonin, the hormone causes calcium accumulation

_____It is the the place where calcium accumulates in great amounts in the body

_____It is the gland which secretes hormone that increases the calcium level in the blood

Answer key:

A. Vitamin D

B. Bones

C. Thyroid

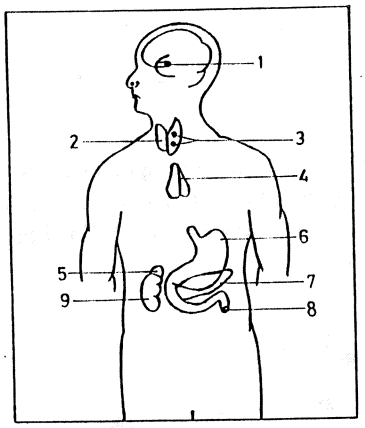
D. Blood

E. Parathyroid gland

F. Vitamin C

G. Adrenal gland

57. Some human endocrine and exocrine glands are numbered in the figure . In the following statements some functions related to these glands are given. Match the statements with the glands in the figure (Put the number of the gland in front of the statements). (3 points)



_____It secretes a hormone which increases the reabsorption of Na^+ into the blood

_____Its secretion is increased when blood Ca^{2+} concentration drops below its normal level

_____If its secretion is decreased the basal metabolic rate also decreases

_____Its secretion is necessary for the development of cellular immunity

_____Its hormone induces red blood cell production in bone marrow

_____Without its hormone, there will be an excessive water loss from the body

_____Its secretion is increased after a carbohydrate rich meal

_____Acidic compounds stimulate its hormone secretion

_____Its secretion is necessary for the chemical breakdown of proteins

58. Deleted

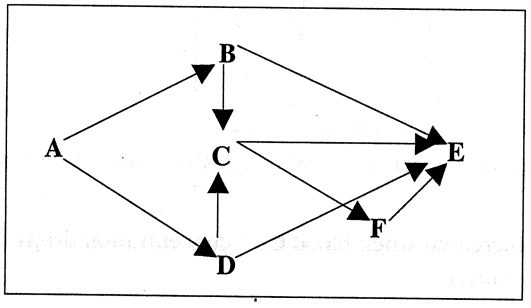
59. Deleted

60. Deleted

ECOLOGY

61. Deleted

62. A food web including 6 different species (A to F) in an ecosystem is shown in the figure illustrated below. The arrows refer to the energy flow directions. Match the following according to that figure. (3.5 points).



Producer species _____

Decomposer species _____

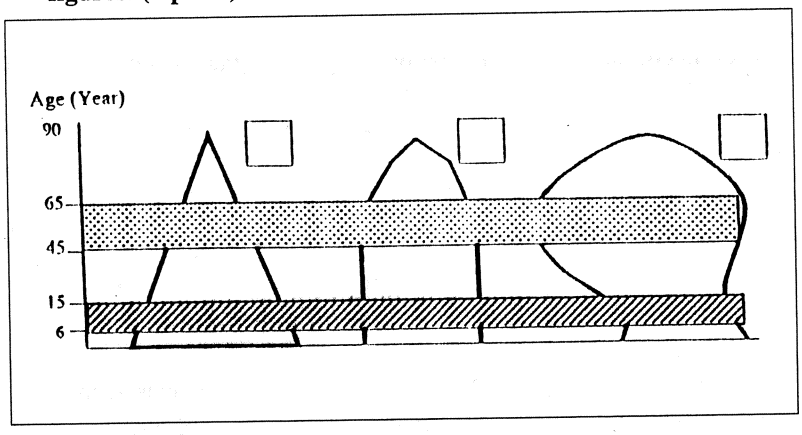
Consumer species on the first trophic level _____

Consumer species on the second trophic level _____

Consumer species on the third trophic level _____

The species in which biomagnification is seen at the highest level _____

63. Age distribution in human populations can be shown in three different types as developing type, stable type and regression type. Mark the stable type age distribution among the following figures. (1 point).



64. In the tables below, one might see the relationships among the populations and the results of these influences. Mark the correct answer(s) by an ellipse in each box. For clarity, an example has been given for competition. (3.5 points).

Competition

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Predation

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Parasitism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Neutralism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Mutualism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

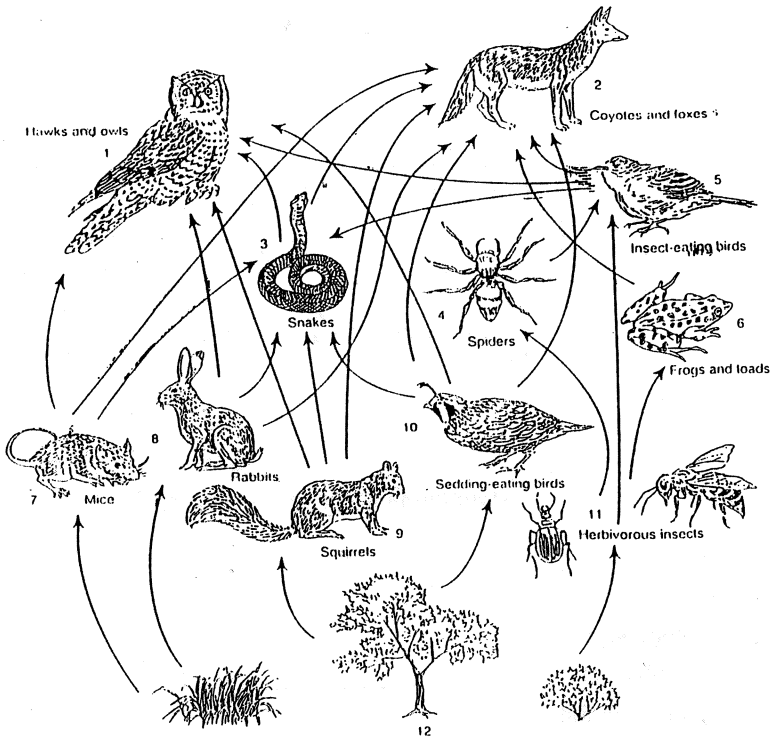
Commensalism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

Amensalism

Species A	Species B
-	-
+	-
0	0
+	+
+	0
-	0

65. In the figure illustrated below the energy flow between the organisms on different trophic levels in a food web is shown. On the scheme given below, please fill in the blanks with the numbers given below for the producers, and 1°, 2°, 3° trophic level consumers according to their levels. (3.6 points).

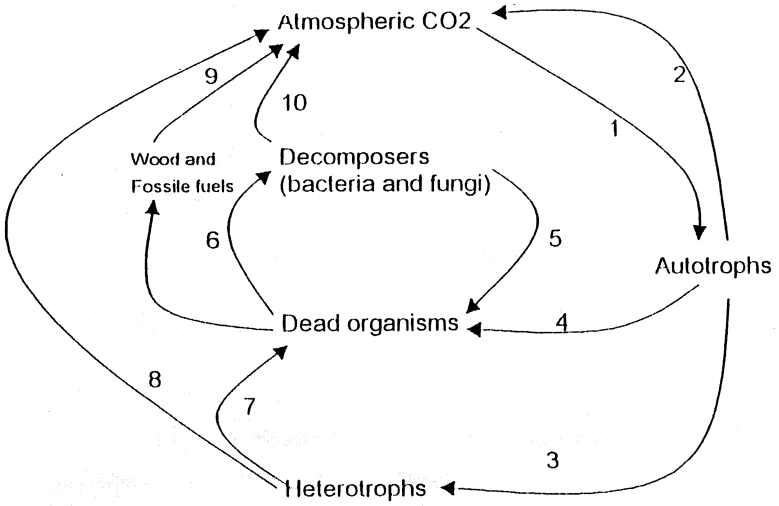


Producers _____ 1^0 consumers _____

2^0 consumers _____ 3^0 consumers _____

66. Deleted

67. The figure given below represents the carbon cycle. Fill in the blanks with the suitable numbers that corresponds to the processes concerning the cycle given to you. (2 points).



Processes:

Combustion _____

Consumption _____

Death _____

Photosynthesis _____

Respiration _____

Decomposition _____

68. In the table, the principle components that form an aquatic ecosystem are given. Put the organisms, and components, in their places in the table given below. (2 points).

I. Fungi

II. Phytoplankton

III. Inorganic components

IV. Zooplankton

The part of the ecosystem	The organism or component
Abiotic substance	
Producer	
Consumer	
Decomposer	

69. Deleted

70. The density of a population that reaches equilibrium is known as the carrying capacity in that species for that habitat. When a population approaches the carrying capacity of any habitat, which of the following shows a tendency to increase? Mark all correct answers with an "X". (2.5 points).

_____ Competition for resources

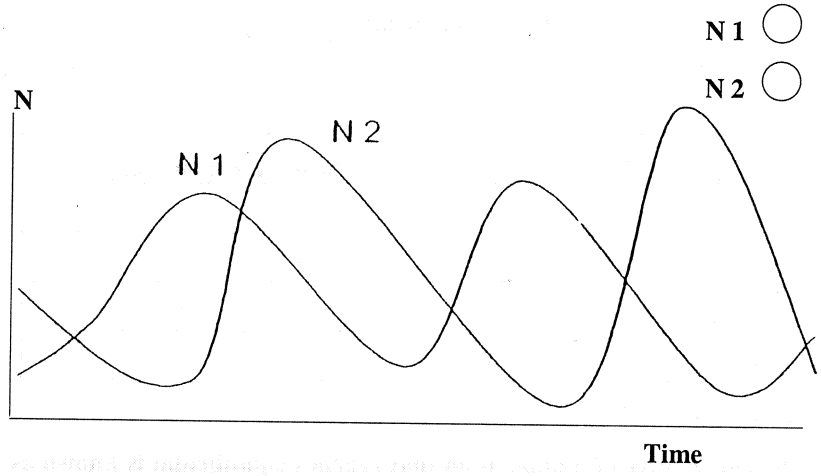
_____ Competition for shelters

_____ Competition for mating areas

_____ Immigration

_____ Accumulation of toxic wastes

71. In any habitat that includes a predator species and its prey, it is known that both of their populations show linked fluctuations. Show the curve belonging to the predator species by putting an "X" in the circle. (1 point).



BEHAVIOUR

72. Thorleif Schjelderup- Ebbe reported the results of a study about the social organization carried out in a poultry yard with Leghorn hens . He found that there was a kind of order (arrangement) in the peck that was related with a real hierarchy in the group.

The following matrix shows the peck frequency within a group of 13 females (from A to M). Each datum indicates the times that the hen identified by the letter in the horizontal line is pecked by one in the vertical line. (4 points)

	M	L	K	J	I	H	G	F	E	D	C	B	A
A	53	45	38	51	35	36	41	29	33	34	41	39	-
B	42	34	37	28	36	29	40	46	43	53	47	-	-
C	36	29	26	44	31	38	24	42	37	32	-	-	-
D	35	27	39	29	36	52	43	31	26	-	-	-	-
E	48	30	27	43	41	40	36	35	-	-	-	-	-
F	43	39	42	40	39	33	31	-	-	-	-	-	-
G	39	38	28	36	41	39	-	-	-	-	-	-	-
H	35	52	47	-	37	-	-	-	-	-	-	-	-
I	37	41	42	54	-	-	-	-	-	-	-	-	-
J	33	29	31	-	-	32	-	-	-	-	-	-	-
K	42	37	-	-	-	-	-	-	-	-	-	-	-
L	39	-	-	-	-	-	-	-	-	-	-	-	-
M	-	-	-	-	-	-	-	-	-	-	-	-	-

72.1. Which of the following female has the highest hierarchy within the group? (2 points)

___A) A ___B) B ___C) J ___D) H ___E) M

72.2. Deleted

72.3. Deleted

72.4. Which ones of the following may be the advantages of a hierarchy of dominance? (2 points).

___A) To suppress the aggression.

___B) To diminish the time and the energy invested in fights.

___C) To diminish the mortality of individuals because of the wounds caused in the combat

___D) A and B.

___E) All the above

73. The "coefficient of relatedness" (r) between various kin pairs that changes according to the relationships in any diploid animal ((For example a mammalian like *Canis lupus* (Canidae)) is given in the table below. (3.5 points).

Parent < > Offspring	**0.50**
Identical twins	**1.00**
Grandparent < > Grandchild	**0.25**
First cousins	**0.125**
Uncle < > nephew	**0.25**

73.1. In view of this, in a haplodiploid bumblebee species *Bombus terrestris* L, 1758 (Apoidea: Hymenoptera), show the coefficient of relatedness (r) in the situations given below. (2.5 points).

Mother < > Daughter _____
Father > Daughter _____
Mother < > Son _____
Sisters _____
Brothers _____

73.2. If you take into consideration the knowledge given in the table above, which of the following statements about the sterilization of the worker bees given as I, II, III and IV is true? (1 point).

I- For the transmission of the genetic knowledge to the next generation, the sterilization of the worker bee, is harmful for it.

II- For the transmission of the genetic knowledge to the next generation, the sterilization of the worker bee, is benefical for it.

III- For the transmission of the genetic knowledge to the next generation, there is no difference on the individual level.

IV- This is an example of altruism.

___A) Only I

___B) Only IV

___C) II and III

___D) II and IV

___E) III and IV

4.4. Answer Key to the Theoretical Test

4.4.1. Part A

1. D
2. E
3. B
4. C
5. Deleted
6. D
7. A
8. D
9. B
10. C
11. B
12. B
13. C
14. A
15. C
16. D
17. E
18. C
19. B
20. D
21. C
22. E
23. A
24. E
25. B
26. C
27. C
28. E
29. D
30. A
31. D
32. A
33. D
34. D
35. A
36. C
37. Deleted
38. B
39. Deleted
40. E
41. B
42. A
43. C
44. C
45. A
46. Deleted
47. B
48. E
49. B
50. Deleted
51. E
52. A
53. A
54. Deleted
55. C
56. E
57. B
58. E
59. Deleted
60. E
61. Deleted
62. D
63. D
64. Deleted
65. Deleted
66. Deleted
67. Deleted
68. E
69. B
70. C
71. D
72. E
73. E
74. C
75. Deleted
76. D
77. B
78. E
79. D
80. E
81. Deleted
82. D
83. D
84. Deleted
85. Deleted
86. E
87. Deleted
88. Deleted
89. D
90. D
91. C
92. B
93. E
94. Deleted
95. Deleted
96. C
97. C
98. A
99. D
100. C
101. C
102. Deleted
103. A
104. D
105. A
106. A
107. Deleted
108. C
109. E
110. A
111. Deleted
112. Deleted
113. Deleted
114. B
115. C
116. C
117. C
118. A
119. A
120. E
121. Deleted
122. A
123. Deleted
124. C
125. Deleted
126. A
127. D
128. Deleted
129. Deleted
130. Deleted
131. A
132. D
133. A
134. E
135. Deleted

4.4.2. Part B

1. Deleted
2. Deleted
3. Deleted
4.

2, 6
2, 3, 4, 5
6
1, 3, 5
1, 3, 5
8
7

5.

A
B

6.

A
B
C
E
D
F

Answer Key-Theoretical Test-Part B

7.

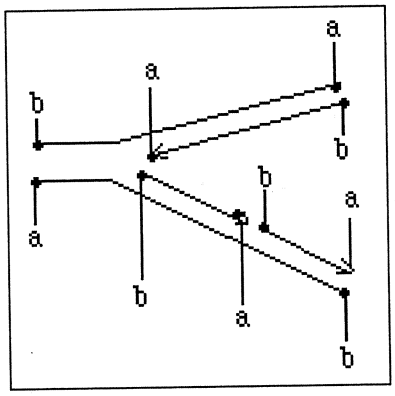
A) I: 580, II: 340 B) I

8.

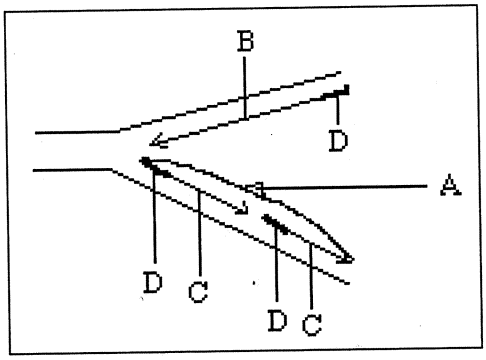
DNA Helicase___2___
Primase___1___
DNA polymerase I 3'→ 5' exonuclease activity___5____
DNA Ligase___4____
Topoisomerase II___6___
DNA Polymerase I 5'→3' exonuclease activity____3____

9.

A)



B)



C)

H
H
E
F

Answer Key-Theoretical Test-Part B

10.

A	B
D	D
C	C
F	E
H	G

11. Deleted

12. Deleted

13.

P
E, P
P
P
E, P
P,E
P

14.

A) 5'GAA GGG CUA UCC UUA UCA AAG
B) Glu-Gly-Leu-Ser-Leu-Ser-Lys-
C) Leu-stop-stop
D) Y
E) N

15. Deleted

16. Deleted

17.

B

D

C

A

18.

A)

__X__

__X__

_____

__X__

_____

B)

__X__ ammonia

_____ nitrite

_____ nitrate

_____ nitrogen gas

19.

a. 0.49

b. 0.25

20.

5/8 or 62.5%

Answer Key-Theoretical Test-Part B

21. Deleted

22.

A) 3
B) 14.98 or 15.0 > 7.815 - 387.45 or 387 > 7.815
C) Genes are linked
D) Deleted

23.

1
4
5
3
2

24.

A, D

25.

A)	+	-
B)	-	+
C)	+	-
D)	-	+
E)	+	-
F)	-	+

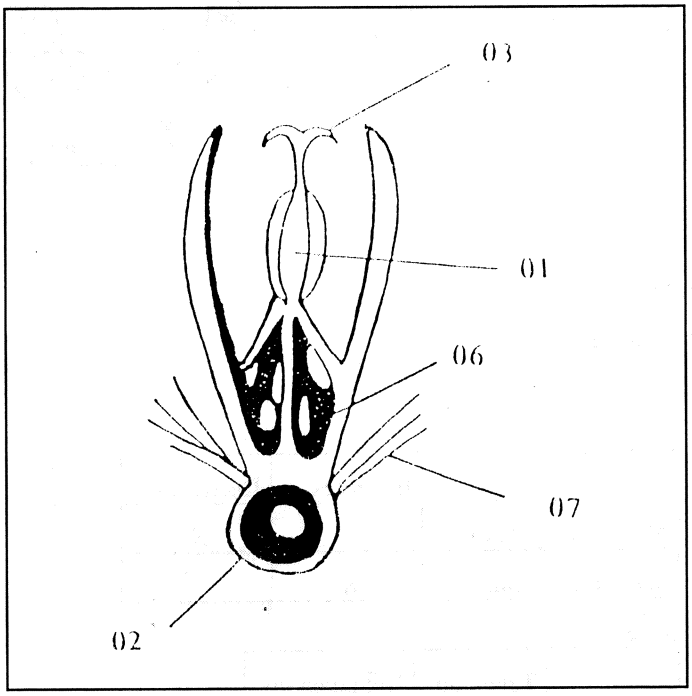
26. Deleted

27. Deleted

28. Deleted

29. Deleted

30.

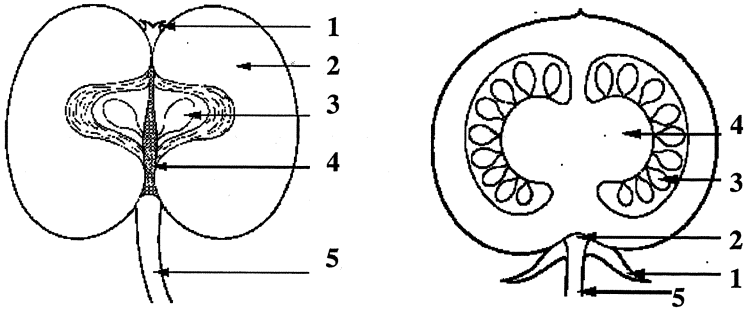


31.

31.1. E
31.2. B

Answer Key-Theoretical Test-Part B

32.



33. Deleted

34. Deleted

35.

35.1.

	Increases	Decreases
Membrane potential		X
pH of the medium	X	

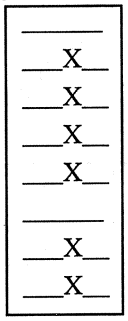
35. 2.

	Taken up	Not taken up
Glucose	X	

36. Deleted

37. Deleted

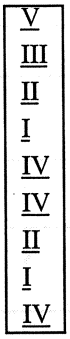
38.



39. Deleted

40. Deleted

41.



42. Deleted

Answer Key-Theoretical Test-Part B

43.

	Fresh water fish (carp)	Bird (pigeon)	Marine fish (sea bass)	Lizard (Chameleon)	Marine mammal (whale)	Terrestrial mammal (Mouse)
Drinks water regularly		X	X			X
Does not drink water	X			X	X	X
Wastes are discarded as ammonia	X		X			
Wastes are discarded as urea					X	X
Wastes are discarded as uric acid		X		X		
Actively secretes salt			X			
Actively absorbs salt	X					
Excretes hipotonic urine relative to the body fluids	X					
Excretes isotonic urine relative to the body fluids			X			
Excretes hipertonic urine relative to the body fluids		X		X	X	X

44.

II
I
III
IV
V

45.

Stimulus	Stimulated organ/tissue	Secreted substance	Target	Biological Response
Decreased red blood cell count	2	4	7	12

46. Deleted

47.

IV
I
III
II

48.

48.1. G
48.2. 1:7

49.

Stretch receptors		Cardioaccelatory center		Cardioinhibitory center		Vasomotor center	
stimulated	inhibited	stimulated	inhibited	stimulated	inhibited	stimulated	inhibited
X			X	X			X

Cardiac output		Arterioles	
increases	decreases	constricted	dilated
	X		X

50. Deleted

Answer Key-Theoretical Test-Part B

51.

1	3	2	13	11	1	8
I	II	III	IV	V	VI	VII

52.

RQ higher	RQ lower
X	
	X
	X
X	

53.

II
V
IV
III
I

54.

Arterial chemoreceptors		Respiratory rate	
stimulation	inhibition	increase	decrease
X		X	

H^+ excretion in the kidneys		Blood partial CO_2 pressure	
increase	decrease	increase	decrease
X			X

55.

3

1, 2, 3, 4

1, 2, 3, 4

1, 2, 3, 4

56.

A

C

B

E

57.

5

3

2

4

9

1

7

8

6

58. Deleted

59. Deleted

60. Deleted

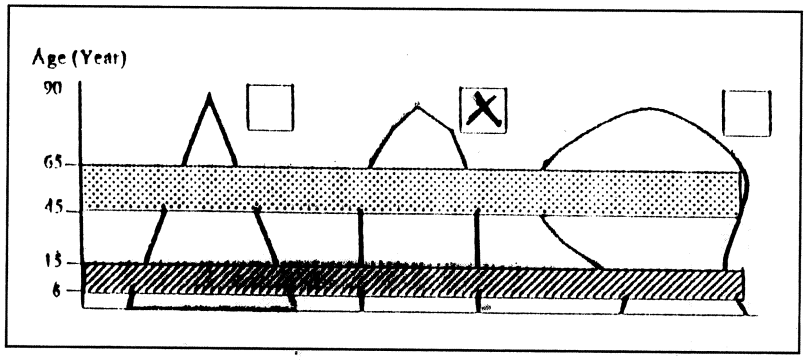
Answer Key-Theoretical Test-Part B

61. Deleted

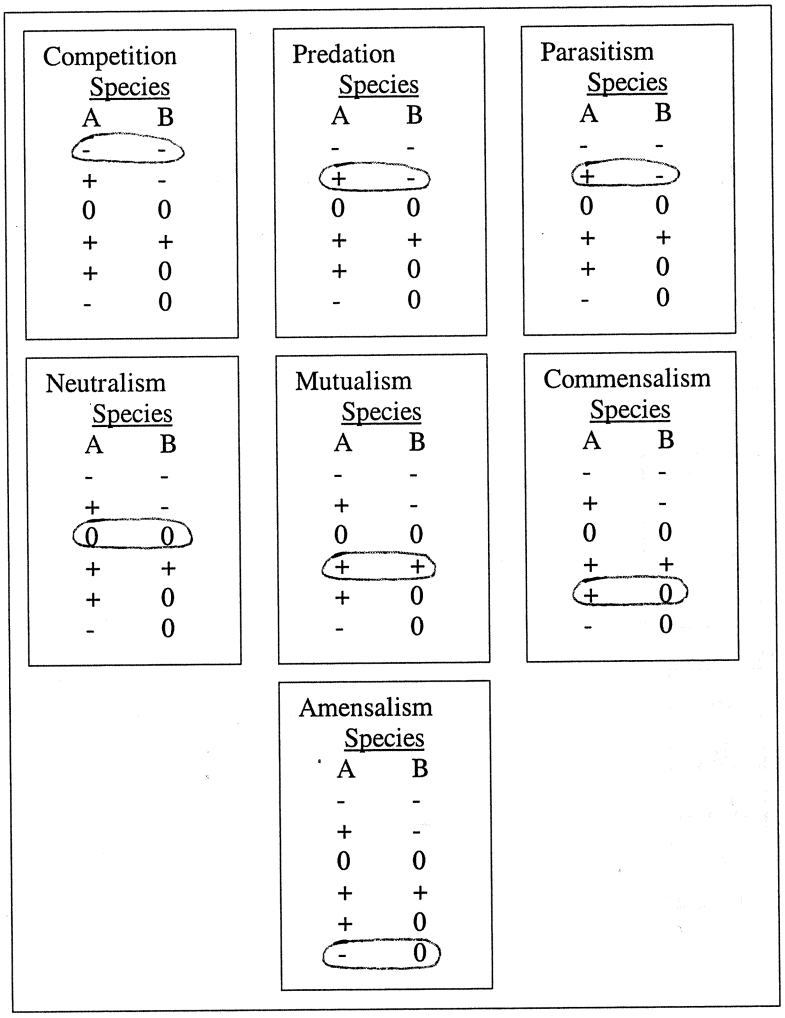
62.

A
E
B,D
C
F
F

63.



64.


Competition
Species
A B
- -
+ -
0 0
+ +
+ 0
- 0
Predation
Species
A B
- -
+ -
0 0
+ +
+ 0
- 0
Parasitism
Species
A B
- -
+ -
0 0
+ +
+ 0
- 0
Neutralism
Species
A B
- -
+ -
0 0
+ +
+ 0
- 0
Mutualism
Species
A B
- -
+ -
0 0
+ +
+ 0
- 0
Commensalism
Species
A B
- -
+ -
0 0
+ +
+ 0
- 0
Amensalism
Species
A B
- -
+ -
0 0
+ +
+ 0
- 0

Answer Key-Theoretical Test-Part B

65.

12
7, 8, 9, 10, 11
1, 2, 3, 4, 5, 6
1, 2, 3, 5

66. Deleted

67.

9
3
4,5,7
1
2,8,10
6

68.

III
II
IV
I

69. Deleted

70.

__X__
__X__
__X__
_____
__X__

71.

N2

72.

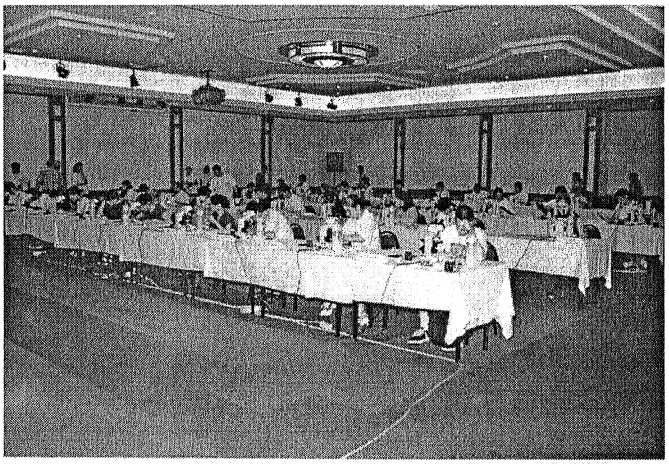
72.1. A
72.2. Deleted
72.3. Deleted
72.4. E

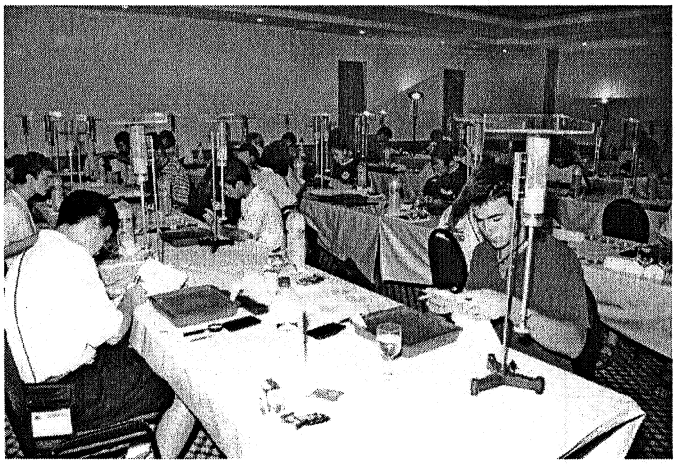
73.

73.1.
0.50
1.00
0.50
0.75
0.50

73.2.
D

Views From the Practical Test





Scenes from the practical test

4.5. Statistical Evaluations

Three tests were administered to the competitors in the 11th International Biology Olympiad: The **Practical Test** (Pr), **The Theoretical Test Part A** (Th-A), and **The Theoretical Test Part B** (Th-B). Some characteristics of those tests are summarized in Table 1.

Table 1. Some Characteristics of the Tests Administered to the Competitors in the 11th International Biology Olympiad

TEST	Subtest	Num-ber of Items	Maximum Score Possible	Minimum Score Obtained	Maximum Score Obtained
PRACTICAL TEST		-	**188.00**	**6.50**	**181.30**
	1. Lab. 1 Task 1	-	25.00	0.00	24.00
	2. Lab. 1 Task 2	-	25.00	0.00	23.00
	3. Lab. 2 Task 1	-	19.00	0.00	18.50
	4. Lab. 2 Task 2	-	25.00	0.00	25.00
	5. Lab. 3	-	50.00	3.00	49.80
	6. Lab. 4	-	44.00	3.50	41.00
THEORETICAL TEST A		**103**	**103**	**2.00**	**88.80**
	1. Cell Biology	33	33	1.80	29.40
	2. Genetics & Evolution	19	19	0.20	17.80
	3. Plant Anat.& Physiol.	17	17	-2.20	12.20
	4. Biosystematics	6	6	-1.20	6.00
	5. Animal Anat.& Physiol.	15	15	-0.60	12.60
	6. Behavior	5	5	-1.00	5.00
	7. Ecology	8	8	-1.40	5.80

Table 1 (cont.)

TEST	Subtest	Num-ber of Items	Maximum Score Possible	Minimum Score Obtained	Maximum Score Obtained
THEORETICAL TEST B		46	136	3.25	117.55
	1. Cell Biology	11	40.6	0.47	37.66
	2. Genetics & Evolution	4	16.5	0.00	13.50
	3. Plant Anat.& Physiol.	6	14.7	1.50	12.70
	4. Biosystematics	2	6.1	0.00	4.62
	5. Animal Anat.& Physiol.	13	31.5	0.78	23.87
	6. Behavior	2	7.5	0.00	6.50
	7. Ecology	8	19.1	0.50	18.70

Some descriptive statistics for the score distributions obtained in the 11th International Biology Olympiad are presented in Table 2.

Table 2. Some Descriptive Statistics for the Score Distributions obtained in the 11th International Biology Olympiad (n=150)

TEST	Subtest	Arith. Mean	Standard Deviation	Skewness of score Distribution	Kurtosis of Score Distribution
PRACTICAL TEST		104.55	24.18	-0.341	0.206
	1. Lab. 1 Task 1	14.55	4.783	-0.647	0.506
	2. Lab. 1 Task 2	12.09	5.329	-0.170	-0.278
	3. Lab. 2 Task 1	7.12	4.175	0.504	-0.560
	4. Lab. 2 Task 2	14.31	6.673	-0.124	-1.069
	5. Lab. 3	32.39	9.383	-0.658	0.447
	6. Lab. 4	24.09	8.376	-0.275	-0.688

Table 2. (cont.)

TEST	Subtest	Arith. Mean	Standard Deviation	Skewness of score Distribution	Kurtosis of Score Distribution
THEORETICAL TEST A		**46.64**	**15.74**	**-0.117**	**-0.877**
	1. Cell Biology	16.92	6.579	-0.214	-0,749
	2. Genetics & Evolution	10.28	3.827	-0.163	-0.586
	3. Plant Anat.& Physiol.	5.31	2.944	0.236	-0.454
	4. Biosystematics	1.81	1.538	0.412	-0.428
	5. Animal Anat.& Physiol.	6.45	2.534	-0.083	-0.469
	6. Behavior	2.66	1.253	-0.404	0.258
	7. Ecology	3.21	1.670	-0.473	-0.358
THEORETICAL TEST B		**56.89**	**19.65**	**0.108**	**-1.047**
	1. Cell Biology	16.87	8.605	-0.007	-1.162
	2. Genetics & Evolution	3.49	3.104	1.194	1.591
	3. Plant Anat.& Physiol.	7.60	2.674	0.073	-0.826
	4. Biosystematics	1.56	1.257	4.038	30.750
	5. Animal Anat.& Physiol.	11.67	5.699	0.203	-0.786
	6. Behavior	2.36	1.714	0.130	-0.866
	7. Ecology	13.34	4.035	-1.375	2.128

Some minor changes might have occured to the statistics presented in Table 2, due to the very late changes in scoring scheme of a few items in the Theoretical Test (Sections A and B). The data for this analysis were optained from the official data files before the Jury decided to make those changes. It is believed that changes in the scoring scheme of a very few items would not result in any significant changes in the statistics presented .

Statistical Evaluations

Item characteristics, such as item difficulty levels and item-test correlations for the items in the Theoratical Test (Section A) are summarized in the section a and b of Table 3, respectively.

Table 3. Item difficulty levels and item-test correlations for the items in the Theoratical Test A

a. Item Dificulty Levels		**b. Item-Test Correlations**	
Percent of Correct Answer	**Frequency**	**Item-Test Correlation**	**Frequency**
90-93	5		
80-89	9		
70-79	22	.60 or over	-
60-69	9	.50 - .59	10
50-59	15	.40 - .49	18
40-49	9	.30 - .39	22
30-39	15	.20 - .29	31
20-29	13	.10 - .19	9
10-19	3	.00 - .09	8
5-9	2	.00 or lower	4
Total No.of Items in Test A	**103**	**Total No.of Items in Test A**	**103**

Reliability estimate (KR20) for the 103-item multiple-choice test is 0.93. Intercorrelations among subtest scores of the **Practical Test** are summarized in Table 4.

Table 4. Intercorrelations Among Subtest Scores of the Practical Test, 11th International Biology Olympiad (n=150)

VARIABLE	Lab 1 Task 1	Lab 1 Task 2	Lab 2 Task 1	Lab 2 Task 2	Lab 3	Lab 4
Lab 1 Task 1	1.00					
Lab 1 Task 2	0.22	1.00				
Lab 2 Task 1	0.19	0.31	1.00			
Lab 2 Task 2	0.24	0.44	0.25	1.00		
Lab 3	0.12	0.27	0.20	0.37	1.00	
Lab 4	0.15	0.25	0.27	0.21	0.27	1.00
Corr. with the TOTAL TEST SCORE (Part-Whole Relation)	**0.45**	**0.63**	**0.52**	**0.68**	**0.70**	**0.64**

Results of the Principal Components Factor Analysis (unrotated) of the Intercorrelations among subtest scores of the **Practical Test** are summarized in Table 5.

Table 5. Principal Components Factor Analsysis (unrotated) of the Intercorrelations Among Subtest Scores of the Practical Test, 11th International Biology Olympiad (n=150)

FACTOR (Synthetic Variable of the Six Subtest Scores)	Eigenvalue	Percent of Total Variance Accounted for	Cumulative Percent of Variance Accounted for
1	2.287	38.12	38.12

Loadings on the first factor of the six variables are 0.47 for the Lab 1 Task 1, 0.71 for Lab 1 Task 2, and 0.59 for Lab 2, Task 1, 0.72 for Lab 2, Task 2, 0.61 for Lab 3, and 0.57 for Lab 4.

Intercorrelations among subtest scores of the **Theoretical Test Part A** are summarized in Table 6.

Table 6. Intercorrelations Among Subtest Scores of the Theoretical Test Part A, 11th International Biology Olympiad (n=150)

VARIABLE	Cell Biology	Genetics & Evolution	Plant Anat. & Physiology	Biosystematics	Animal Anat. & Physiology	Behaviors	Ecology
Cell Biology	1.00						
Genetics & Evolution	0.69	1.00					
Plant Anat. & Physiology	0.64	0.49	1.00				
Biosystematics	0.49	0.42	0.42	1.00			
Animal Anat. & Physiology	0.62	0.53	0.52	0.41	1.00		
Behavior	0.19	0.26	0.21	0.10	0.19	1.00	
Ecology	0.54	0.46	0.42	0.33	0.47	0.17	1.00
Corr. with the TOTAL TEST SCORE (Part-Whole Relation)	**0.92**	**0.82**	**0.76**	**0.59**	**0.75**	**0.32**	**0.64**

Intercorrelations among subtest scores of the **Theoretical Test Part B** are summarized in Table 7.

Table 7. Intercorrelations Among Subtest Scores of the Theoretical Test Part B, 11th International Biology Olympiad (n=150)

VARIABLE	Cell Biology	Genetics & Evolution	Plant Anatomy & Physiology	Biosystem-atics	Animal Anatomy & Physiology	Behavior	Ecology
Cell Biology	1.00						
Genetics & Evolution	0.42	1.00					
Plant Anatomy & Physiology	0.58	0.29	1.00				
Biosystematics	0.15	0.01	0.14	1.00			
Animal Anatomy & Physiology	0.65	0.43	0.54	0.06	1.00		
Behavior	0.35	0.25	0.30	0.06	0.27	1.00	
Ecology	0.34	0.26	0.36	0.20	0.40	0.53	1.00
Corr. with the TOTAL TEST SCORE (Part-Whole Relation)	**0.88**	**0.58**	**0.70**	**0.22**	**0.83**	**0.51**	**0.62**

Results of the Principal Components Factor Analysis (unrotated) of Intercorrelations among subtest scores of the **Practical Test (Partss A and B)** are summarized in Table 8.

Table 8. Principal Components Factor Analşysis (unrotated) of Intercorrelations Among Subtest Scores of the Theoretical Test (Parts A and B), 11th International Biology Olympiad (n=150)

FACTOR (Synthetic Variable of the Fourteen Subtest Scores)	Eigenvalue	Percent of Total Variance Accounted for	Cumulative Percent of Variance Accounted for
1	6.24	44.58	44.58
2	1.15	8.25	52.83
3	1.06	7.54	60.38

Factor Loadings (unrotated) of fourteen subtest scores of the **Practical Test A and B** are shown in Table 9.

Table 9. Factor Loadings (unrotated) of Fourteen Subtest Scores of the Theoretical Test (Parts A and B), 11th International Biology Olympiad (n=150)

VARIABLE (Subtest)	Factor 1	Factor 2	Factor 2	Communality
Th. A: Cell Biology	.874	-.169	.015	.792
Th. A: Genetics & Evolution	.780	-.022	-.022	.610
Th. A: Plant Anat. & Physiology	.740	-.189	.109	.596
Th. A: Biosystematics	.609	-.192	.278	.486
Th. A: Animal Anat. & Physiol.	.761	-.044	-.047	.583
Th. A: Behavior	.334	.515	-.126	.393
Th. A: Ecology	.654	-.026	-.192	.465
Th. B: Cell Biology	.828	-.171	.060	.718
Th. B: Genetics & Evolution	.530	.100	-.367	.425
Th. B: Plant Anatomy &	.754	-.117	.080	.588
Th. B: Biosystematics	.181	.310	.856	.861
Th. B: Animal Anat. & Physiol.	.806	-.218	-.052	.700
Th. B: Behavior	.494	.563	-.176	.592
Th. B: Ecology	.609	.522	.025	.644

As will be noticed, the first factor seems to capture the "core" of what is measured. The second factor reflects some specific variance of "Behavior" and "Ecology" subtests. Finally, the third factor seems to pick up the variation left unexplained for only "Biosystematics" subtest. In short, the first factor which can account for up to 45% of total variation seems to be worthy of attention.

Intercorrelations among the test scores obtained using the **Practical Test** and the two **Theoretical Tests** (Part A and Part B) are presented in Table 10.

Table 10. Intercorrelations Among Test Scores Obtained Using Practical Test, The Two Theoretical Tests (Parts A and Part B), 11th International Biology Olympiad (n=150)

VARIABLE	Practical Test	Theoretical Test A	Theoretical Test B
Practical Test	1.00		
Theoretical Test A	0.48	1.00	
Theoratical Test B	0.44	0.89	1.00

Taking the contents of the tests used, a correlation of 0.48 between the practical and the theoretical parts of the examination, and a correlation of 0.89 between the two parts of the theoretical test seem to be at the expected levels,

Principal Components Factor Analysis (unrotated) of Intercorrelations among test scores of the **Practical Test, Theoretical Test A** and **Theoretical Test B** are summarized in Table 11.

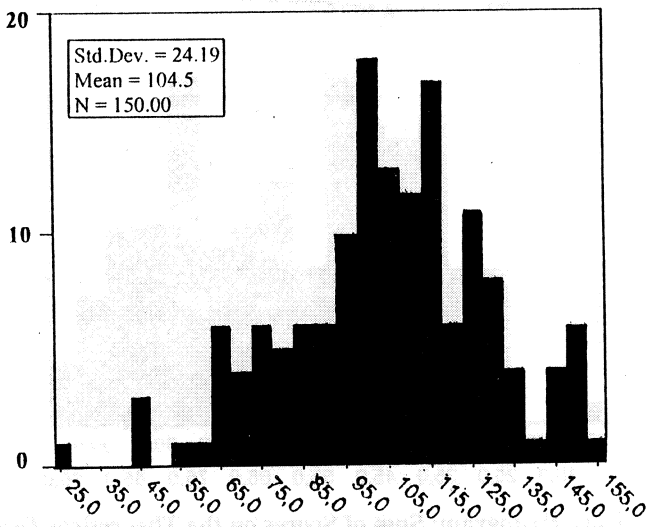
Table 11. Principal Components Factor Analşysis (unrotated) of Intercorrelations Among The Three Test Scores (Practical Test, Theoretical Test Part A, and Theoretical Test Part B), 11th International Biology Olympiad (n=150)

FACTOR (Synthetic Variable of the Three Test Scores)	Eigenvalue	Percent of Total Variance Accounted for	Cumulative Percent of Variance Accounted for
1	2,237	74.56	74.56

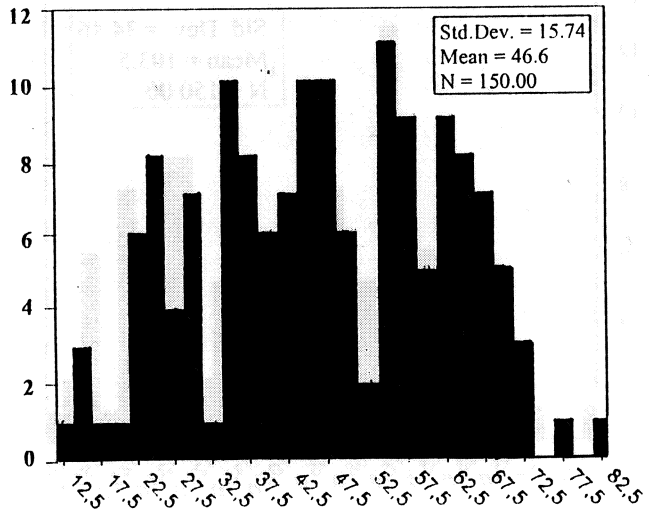
Loadings on the first factor of the three variables are 0.70 for the Practical Test, 0.94 for the Theoretical Test A, and 0.93 for the Theoretical Test B.

Appendix

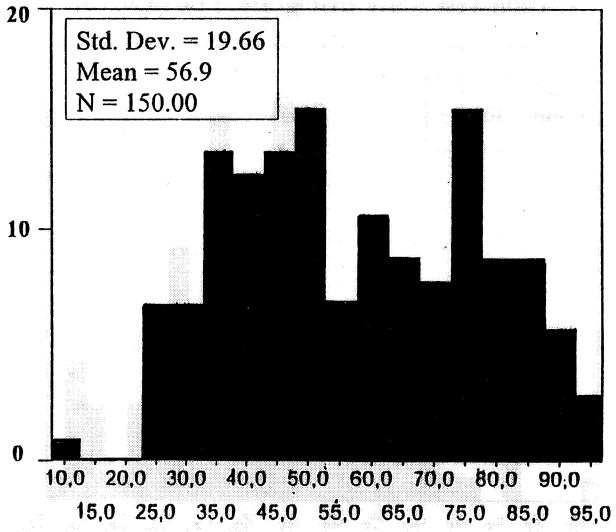
1. Total Test Score Histogram: Practical Test



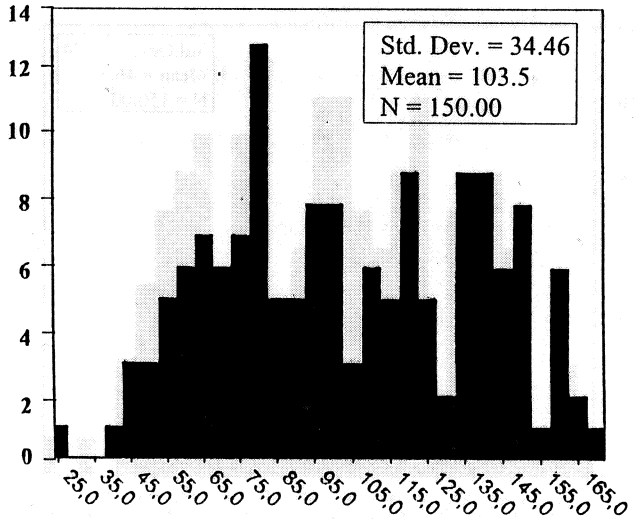
2. Total Test Score Histogram: Theoretical Test A



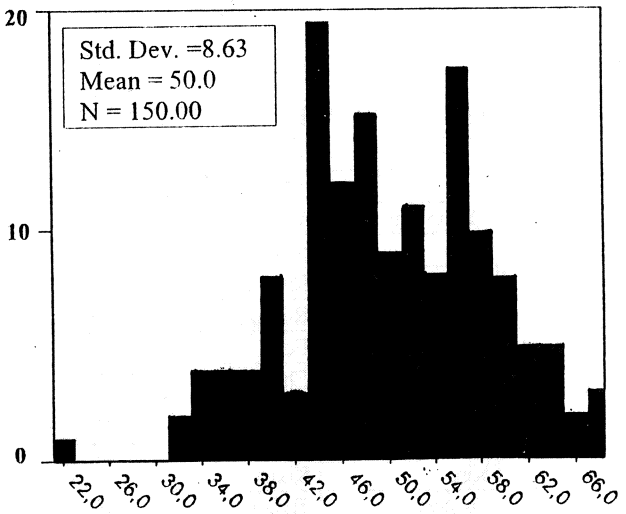
3. Total Test Score Histogram: Theoretical Test B



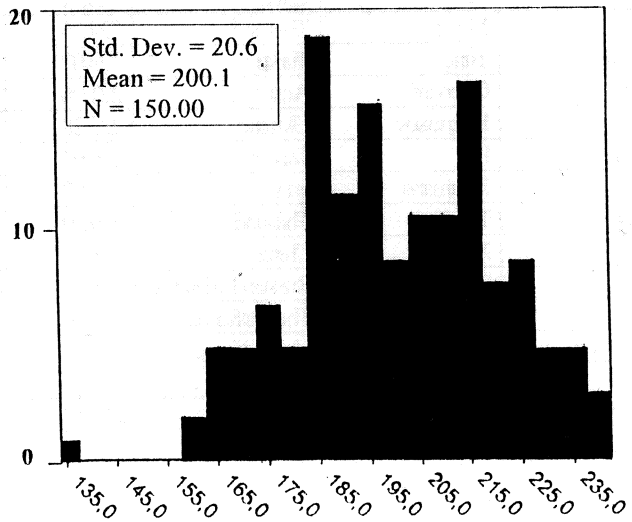
4. Total Score Histogram: Sum of Scores on the Theoretical Test Part A and Part B



5. Score Histogram: Weighted Sum of Practical and Theoretical Section Scores (Weights are 0.43 and 0.57 respectively)



6. Score Histogram: Weighted Sum of Practical and Theoretical Section Scores on a Score Scale With the Mean of 200 and St. Dev. of 20



5. Results and Medals Awarded

Name	Surname	Country	Final Score	Medal
Xu	Wang	China	243,65	Gold
Dong-Hun	Lee	Korea	242,08	Gold
Kuan-Chuan	Tsou	Taiwan	240,89	Gold
Ye-Hyun	Lee	Korea	237,25	Gold
Jen-Jia	Yang	Taiwan	236,74	Gold
Hsiang-Chih	Lu	Taiwan	236,10	Gold
Troung	Quang Huy	Vietnam	233,82	Gold
Sun-Young	Kim	Korea	233,49	Gold
Gleb	Savelyev	Russian Federation	231,77	Gold
Pavel	Flegontov	Russian Federation	231,56	Gold
Maxim	Nemchinov	Belarus	230,11	Gold
Zhentao	Song	China	229,37	Gold
Andriy	Slonchak	Ukraine	228,62	Gold
Timothy	Nilson-Brown	Australia	228,37	Gold
Joon Sun	Kim	Korea	227,60	Gold
Yusuf	Özuysal	Turkey	227,08	Gold
Leouidas	Apostolides	Germany	225,88	Silver
Olexandr	Kostov	Ukraine	225,74	Silver
Tharathorn	Rimchala	Thailand	225,66	Silver
Jiangbin	Ye	China	225,51	Silver
Sathaporn	Manee	Thailand	224,05	Silver
Tansel Sıtkı	Tunç	Turkey	223,07	Silver
Daniel	Gilbourd	Australia	221,96	Silver
Vitaliy	Kuznetsov	Ukraine	221,28	Silver
Ying-Chun	Lo	Taiwan	220,94	Silver
Negar	Faramarzi	Iran	220,02	Silver
Pongsakorn	Titachote	Thailand	219,40	Silver
Liangliang	Xu	China	218,34	Silver
Vasiliy	Gavrilok	Russian Federation	218,27	Silver
Eva	Deinum	The Netherlands	218,26	Silver
Rupert Edward	Griffiths	United Kingdom	218,24	Silver
Münir	Akkaya	Turkey	218,02	Silver
Nurmuhammedov	Üsenkanov	Kyrgyzstan	216,39	Silver

Name	Surname	Country	Final Score	Medal
Alexandr	Yanofsky	Belarus	216,32	Silver
Yerbol	Kurmangaliyev	Kazakhstan	216,04	Silver
Soroosh	Alberzi	Iran	216,01	Silver
Martin	Fikacek	Czech Republic	215,70	Silver
Cafer	Özdemir	Turkey	215,66	Silver
Sahajal	Dohooria	India	215,65	Silver
Martin	Hasemeyer	Germany	215,56	Silver
Silvester	De Noojier	The Netherlands	215,39	Silver
Maria	Barker	Australia	214,77	Silver
Alisher	Aliyev	Uzbekistan	214,60	Silver
Marielle	Winarto	The Netherlands	214,37	Silver
Elisa	Dultz	Germany	214,29	Silver
Vera	Kudrasheva	Belarus	214,05	Silver
Olga V.	Lisochenko	Ukraine	213,51	Bronze
Oliver	Tam	Australia	213,30	Bronze
Piotr	Skrzypczyk	Poland	213,21	Bronze
Alina	Korbut	Russian Federation	213,12	Bronze
Anton	Nesveldin	Kazakhstan	212,08	Bronze
Joanna	Mierzynska	Poland	211,97	Bronze
Luchezar	Atanassov	Bulgaria	211,75	Bronze
Jahongir	Turgunov	Uzbekistan	210,44	Bronze
Pallawi	Torka	India	210,41	Bronze
Ljudmila	Nikolova	Bulgaria	209,62	Bronze
Kuanysh	Yergalivey	Kazakhstan	209,12	Bronze
Miroslav	Srba	Czech Republic	208,60	Bronze
Rachanon	Murathanun	Thailand	206,73	Bronze
Reza	Behroozi	Iran	206,04	Bronze
Nayuta	Brand	Switzerland	205,97	Bronze
Jakup	Straka	Czech Republic	205,07	Bronze
Sergey	Pryhozhy	Belarus	204,57	Bronze
Iulian Sorin	Hostiuc	Romania	204,38	Bronze
Eugenio Fernando	Fernandez	Argentina	204,31	Bronze
Roxana	Sarbulescu	Romania	204,16	Bronze
Tomas	James Welsh	United Kingdom	203,97	Bronze
Ashok	Sekhar	India	203,64	Bronze

Name	Surname	Country	Final Score	Medal
Tran	Cong Tu	Vietnam	203,62	Bronze
Zillah Louise	Boraston	United Kingdom	203,12	Bronze
Christopher Gordon	Wilson	United Kingdom	200,95	Bronze
Klara	Hoffmannova	Czech Republic	200,74	Bronze
Artis	Apinis	Latvia	199,88	Bronze
Emilio Nicolas	Scarinci	Argentina	199,86	Bronze
Vanya	Dimitrova	Bulgaria	199,68	Bronze
Pavol	Biath	Slovak Republic	199,46	Bronze
Katarina	Darulova	Slovak Republic	198,36	Bronze
Ayaz	Necefov	Azerbaijan	198,29	Bronze
Ezequiel	Juritz	Argentina	197,88	Bronze
Danilel	Bak	Poland	197,80	Bronze
Benjamin	Lux	Germany	197,69	Bronze
Nancy	Saucedo Fabela	Mexico	197,31	Bronze
Putri	Dianita	Indonesia	197,20	Bronze
Aziz	Ashirov	Uzbekistan	197,10	Bronze
Swati	Pandey	India	196,80	Bronze
Peter	Desmet	Belgium	196,79	Bronze
Merja	Matilainen	Finland	195,49	Bronze
Irene	Trevino Frenk	Mexico	195,42	Bronze
Zuzana	Koledova	Slovak Republic	194,56	Bronze
Yerokhin	Maxim	Kazakhstan	194,20	Bronze
Brenda	Parker	Ireland	194,07	Bronze
Chary	Corayev	Turkmenistan	193,76	
Askar	Kerimaliyev	Kyrgyzstan	193,58	
Matthias	Wenger	Switzerland	193,13	
Karin	Gillenius	Sweden	193,04	
Tomas	Doyle	Ireland	192,42	
Nguyen	Thi Thanh	Vietnam	191,87	
Michiel	Bouwhuis	The Netherlands	191,86	
Dastan	Siyayer	Kyrgyzstan	191,82	
Fernando	Sorroche	Argentina	191,00	
Baiba	Pizica	Latvia	190,71	
Elisa	Lyyrtö	Finland	190,54	
Sarah	Picardo	Ireland	190,31	

Name	Surname	Country	Final Score	Medal
Andreas	Nilsson	Sweden	189,50	
Daniel	Wegmann	Switzerland	189,41	
Pontus	Forsberg	Sweden	189,11	
Tomas	Kadlec	Slovak Republic	187,58	
Ali	Mjtahed	Iran	187,37	
Fredrik	Odeen	Sweden	187,33	
Erkin	Rehimov	Azerbaijan	187,25	
Marie	Manandise	Belgium	186,94	
Dimitri	Teperik	Estonia	186,62	
Todor	Yuriev	Bulgaria	186,61	
Behzad	Alimuhammedov	Uzbekistan	185,98	
Cyrille	Prestianni	Belgium	185,19	
Marco	Yasseft C. Diaz	Mexico	185,10	
Johanne	Kase	Estonia	184,91	
Amngeldi	Rahmanov	Turkmenistan	184,86	
Marina	Platonova	Latvia	184,81	
Vlad	Padurariu	Romania	184,65	
Dorjderem	Sukhrogchaa	Mongolia	184,64	
Mihail	Petrov	Estonia	184,63	
Sofie	Hoorelbeke	Belgium	184,61	
Juris	Ivulans	Latvia	184,25	
Rospita Dian	Tobing	Indonesia	183,98	
Nina	Martilla	Finland	182,18	
Raluca	Popescu	Romania	180,17	
Daniel	Rigney	Ireland	178,59	
Ade	Kurniawan	Indonesia	178,29	
Rizvan	İmamaliyev	Azerbaijan	178,18	
Arttu	Jolma	Finland	177,97	
Krzysztof	Domagata	Poland	176,93	
Mikk	Gashkov	Estonia	175,84	
Orhan	Cavadov	Azerbaijan	175,84	
Nguyen	Thi Phu	Vietnam	175,56	
Ihlas	M. Nazarov	Turkmenistan	173,70	
Alfredo	Meneses Matilde	Mexico	173,02	
Iulian Nicolae	Bujoreanu	Moldova	170,55	

Results and Medals Awarded

Name	Surname	Country	Final Score	Medal
Nyoman R.	Dewi	Indonesia	169,66	
Liviu Nicon	Ungur	Moldova	169,42	
Adrian Andrei	Cretu	Moldova	169,29	
Guvanach	Ovezmuradov	Turkmenistan	168,95	
Anarmaa	Shatkhuu	Mongolia	166,82	
Darya	Tirtişnaya	Kyrgyzstan	164,74	
Simone	Hegner	Switzerland	164,25	
Fatemah	Ali	Kuwait	163,32	
Igor Alexandru	Movileanu	Moldova	162,83	
Mohammed	Alfeeli	Kuwait	160,11	
Nomingeril	Monkhcoz	Mongolia	159,42	
Eilaf	Al-Shamaly	Kuwait	137,33	

It is good to have a medal

Participants of the 11th IBO

Country	Name	Status
Argentina		
Gladys	Mori De Moro	Delegation Leader
María Isabel	Ortiz De Degioanni	Deputy Leader
Graciela	Raffaini	Observer
José	Priotto	Observer
Fernando	Sorroche	Competitor
Emilio Nicolas	Scarinci	Competitor
Eugenio Fernando	Fernandez	Competitor
Ezequiel	Juritz	Competitor
Australia		
Andrew	Walter	Delegation Leader
Vanessa	Marsden	Deputy Leader
Timothy	Nilson-Brown	Competitor
Maria	Barker	Competitor
Daniel	Gilbourd	Competitor
Oliver	Tam	Competitor
Azerbaican		
Adalat	Faracov	Delegation Leader
Bülent	Özen	Deputy Leader
Ayaz	Necefov	Competitor
Erkin	Rehimov	Competitor
Orhan	Cavadov	Competitor
Rizvan	Imamaliyev	Competitor
Belarus		
Natalia	Maximova	Delegation Leader
Galina	Romanovec	Deputy Leader
Irina	Bayeva	Observer
Sergey	Pryhozhy	Competitor
Vera	Kudrasheva	Competitor
Maxim	Nemchinov	Competitor
Alexandr	Yanofsky	Competitor

Participants

Belgium		
Hugo	Vandendries	Delegation Leader
Marleen	Van Strydonck	Deputy Leader
Miel	Van Damme	Observer
Gerard	Cobut	Delegation Leader
Laurent	Minet	Observer
Martine	Castiaux	Observer
Arnold	Halsberghe	Guest
Louis	De Vos	Jury Chairman
Peter	Desmet	Competitor
Sofie	Hoorelbeke	Competitor
Marie	Manandise	Competitor
Cyrille	Prestianni	Competitor
Bulgaria		
Raycho I.	Dimkov	Delegation Leader
Ivanka	Nikolova	Deputy Leader
Ljudmila	Nikolova	Competitor
Luchezar	Atanassov	Competitor
Vanya	Dimitrova	Competitor
Todor	Yuriev	Competitor
China		
Enshan	Liu	Delegation Leader
Guangyao	Wu	Deputy Leader
Hong	Cheng	Observer
Zhentao	Song	Competitor
Liangliang	Xu	Competitor
Xu	Wang	Competitor
Jiangbin	Ye	Competitor
Czech Republic		
Vitezslav	Bicik	Delegation Leader
Jan	Stoklasa	Deputy Leader
Tomas	Soukup	Observer
Klara	Hoffmannova	Competitor
Jakup	Straka	Competitor
Martin	Fikacek	Competitor
Miroslav	Srba	Competitor

Estonia		
Illar	Leuhin	Delegation Leader
Radko	Avi	Deputy Leader
Johanna	Kase	Competitor
Dmitri	Teperik	Competitor
Mikk	Gashkov	Competitor
Mihhail	Petrov	Competitor
Finland		
Seija	O. Lahdesmaki	Delegation Leader
Eira	Poranen	Deputy Leader
Elisa	Lyyrtö	Competitor
Arttu	Jolma	Competitor
Nina	Marttila	Competitor
Merja	Matilainen	Competitor
Germany		
Eckhard	Lucius	Delegation Leader
Christiane	Muhle	Deputy Leader
Regina	Manitz-Schaefer	Observer
Ralf	Kittler	Observer
Chritine	Labahn-Lucius	Guest
Tobias	Lucius	Guest
Lennart	Lucius	Guest
Julia	Lucius	Guest
Leonidas	Apostolidis	Competitor
Elisa	Dultz	Competitor
Martin	Haesemeyer	Competitor
Benjamin	Lux	Competitor
India		
Bharat	Chattoo	Delegation Leader
Bakhtaver S.	Mahajan	Deputy Leader
Ardvin	Kumar	Observer
Pallawi	Torka	Competitor
Sahajal	Dhooria	Competitor
Ashok	S.	Competitor
Swati	Pandey	Competitor

Indonesia		
Agus Dana	Permana	Delegation Leader
Sucipto	Hariyanto	Observer
Maelita Ramdani	Moeis	Observer
Putri	Dianita	Competitor
Nyoman R.	Dewi	Competitor
Rospita Dian	Tobing	Competitor
Ade	Kurniawan	Competitor
Islamic Republic of Iran		
Mohammad	Karamudini	Delegation Leader
Mahnaz	Azarnia	Deputy Leader
Hossein	Daneshfar	Observer
Negar	Faramarzi	Competitor
Reza	Behroozi	Competitor
Soroosh	Alberzi	Competitor
Ali	Mjtahed	Competitor
Ireland		
Michael A.	Cotter	Delegation Leader
Richard	O'kennedy	Deputy Leader
Sarah	Picardo	Competitor
Daniel	Rigney	Competitor
Tomás	Doyle	Competitor
Brenda	Parker	Competitor
Kazakhstan		
Amangeldy	Bissenbayev	Delegation Leader
Sara	Kudabayeva	Deputy Leader
Duran	Kala	Observer
Umit	Zhexenbayeva	Observer
Anton	Nesveldin	Competitor
Kuanysh	Yergaliyev	Competitor
Yerbol	Kurmangaliyev	Competitor
Yerokhin	Maxim	Competitor
Kenya		
İlhan	Türkeri	Observer

Korea		
Nam Kee	Chang	Delegation Leader
Jung-Ill	Cho	Deputy Leader
Kyoung-Ho	Kim	Observer
Young-Deuk	Rim	Observer
In-Hye	Oh	Observer
Jun Soon	Kim	Competitor
Ye-Hyun	Lee	Competitor
Dong-Hun	Lee	Competitor
Sun-Young	Kim	Competitor
Kuwait		
Rashid	Al-Shamaly	Delegation Leader
Hana	Farhan	Deputy Leader
Abdulhadi	Alhusani	Observer
Nouriah	Al-Shamaly	Guest
Fadhila	Ali	Guest
Eilaf	Al-Shamaly	Competitor
Fatemah	Ali	Competitor
Mohammad	Alfeeli	Competitor
Kyrgyzstan		
Ahmatova	Aigul Toktosuvna	Delegation Leader
Emrullah	Durmaz	Deputy Leader
Nurmuhammedov	Üsenkanov	Competitor
Dastan	Siyayer	Competitor
Askar	Kerimaliyev	Competitor
Darya	Tirtişnaya	Competitor
Latvia		
Uldis	Kondratovics	Delegation Leader
Maruta	Kusina	Deputy Leader
Marina	Platonova	Competitor
Baiba	Pizica	Competitor
Artis	Apinis	Competitor
Juris	Ivulans	Competitor

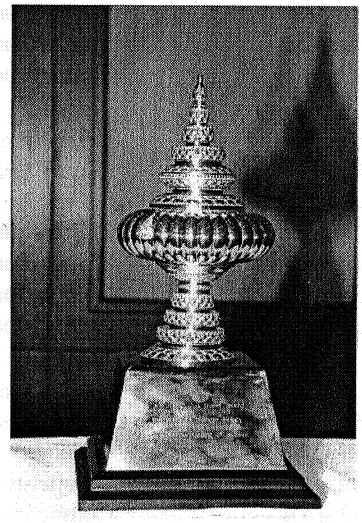
Mexico		
Gilda	Flores	Delegation Leader
Adolfo	Obaya	Deputy Leader
Lourdes	Rosas	Observer
Nancy	Saucedo Fabela	Competitor
Irene	Trevino Frenk	Competitor
Alfredo	Meneses Matilde	Competitor
Marco	Yasseft Coeto Diaz	Competitor
Moldova		
Nadejda Gheorghe	Velishco	Delegation Leader
Mihai Gheorghe	Leshanu	Deputy Leader
Adrian Andrei	Cretu	Competitor
Igor Alexandru	Movileanu	Competitor
Liviu Nicon	Ungur	Competitor
Iulian Nicolan	Bujoreanu	Competitor
Mongolia		
Ulykpan	Kaman	Delegation Leader
Zafer	Kılınç	Deputy Leader
Dorjderem	Sukhrogchaa	Competitor
Anarmaa	Sharkhuu	Competitor
Nomingeril	Monkhcoz	Competitor
Poland		
Bronislaw	Cymborowski	Delegation Leader
Maciej	Panczykowski	Deputy Leader
Joanna	Mierzynska	Competitor
Piotr	Skrzypczyk	Competitor
Danilel	Bak	Competitor
Krzysztof	Domagata	Competitor
Romania		
Elena	Hutanu	Delegation Leader
Veronica	Stoian	Deputy Leader
Iulian Sorin	Hostiuc	Competitor
Roxana	Sarbulescu	Competitor
Vlad	Padurariu	Competitor
Raluca	Popescu	Competitor

Russian Federation		
Valeria	Kuçmenko	Delegation Leader
Vladimir	Paseçnik	Deputy Leader
Pavel	Flegontov	Competitor
Vassili	Gavriliouk	Competitor
Alina	Korbut	Competitor
Gleb	Savelyev	Competitor
Slovenia		
Ana	Ferilih	Observer
Primoz	Skulj	Observer
Slovak Republic		
Pavol	Elias	Delegation Leader
Ivan	Bartik	Deputy Leader
Zuzana	Koledova	Competitor
Katarina	Darulova	Competitor
Pavol	Biath	Competitor
Tomas	Kadlec	Competitor
Sweden		
Andreas	Ehn	Delegation Leader
Christina	Broman	Deputy Leader
Asa	Jooper-Jaan	Observer
Birgitta	Berggren	Observer
Andreas	Nilsson	Competitor
Fredrik	Odeen	Competitor
Pontus	Forsberg	Competitor
Karin	Gillenius	Competitor
Switzerland		
Thomas	Braschler	Delegation Leader
Sacha	Javor	Deputy Leader
Nayuta	Brand	Competitor
Matthias	Wenger	Competitor
Daniel	Wegmann	Competitor
Simone	Hegner	Competitor

Participants

Taiwan		
Jerming	Tseng	Delegation Leader
Ling-Ling	Lee	Deputy Leader
Chao-Hsien	Lin	Observer
Lin-Chih	Hu	Observer
Shu-Chuan	Hsiao	Observer
Kuan-Chuan	Tsou	Competitor
Ying-Chun	Lo	Competitor
Jen-Jia	Yang	Competitor
Hsiang-Chih	Lu	Competitor
Thailand		
Dr.Pitiwong	Tantichodok	Delegation Leader
Dr.Poonpipope	Kasemsap	Deputy Leader
Mr.Choosilp	Attachoo	Observer
Dr.Pongchai	Harnyuttanakorn	Observer
Rungnapha	Sudatep	Observer
Yongyut	Saithong	Observer
Tharathorn	Rimchala	Competitor
Rachanon	Murathanun	Competitor
Pongsakom	Titachote	Competitor
Sathaporn	Manee	Competitor
The Netherlands		
Hans	Morelis	Delegation Leader
Paula	Van Kranenburg	Deputy Leader
Henri	Groeneveld	Observer
Silvester	De Nooijer	Competitor
Eva	Deinum	Competitor
Marielle	Winarto	Competitor
Michiel	Bouwhuis	Competitor
Turkey		
Ertunç	Gündüz	Delegation Leader
Hülya	Koyuncu	Deputy Leader
Yusuf	Özuysal	Competitor
Münik	Akkaya	Competitor
Cafer	Özdemir	Competitor
Tansel Sıtkı	Tunç	Competitor

Turkmenistan		
Ogulsapar	Nazarova	Delegation Leader
Ismail	Arduç	Deputy Leader
Chary	Corayev	Competitor
Guvanch	Ovezmuradov	Competitor
Ihlas	Muhammednazarov	Competitor
Amngeldi	Rahmanov	Competitor
Ukraine		
Lidiya S.	Vaschenko	Delegation Leader
Olga V.	Danilova	Deputy Leader
Andriy	Slonchak	Competitor
Vitaliy	Kuznetsov	Competitor
Olga V.	Lisochenko	Competitor
Olexandr	Kostov	Competitor
United Kingdom		
Andrew Kevin	Headford	Delegation Leader
David Stewart	Arkieson	Deputy Leader
Tomas	James Welsh	Competitor
Rupert Edward	Griffiths	Competitor
Zillah Louise	Boraston	Competitor
Christopher Gordon	Wilson	Competitor
Uzbekistan		
Saydulla	Dadayev	Delegation Leader
Mustafa	Doğan	Deputy Leader
Abdulkerim	Çankaya	Observer
Alisher	Aliyev	Competitor
Jahongir	Turgunov	Competitor
Behzad	Alimuhammedov	Competitor
Aziz	Ashirov	Competitor
Vietnam		
Pham	Van Lap	Delegation Leader
Nguyen	Mong Hung	Deputy Leader
Le Dinh	Tuan	Observer
Truong	Quang Huy	Competitor
Tran	Cong Tu	Competitor
Nguyen	Thi Thanh Cham	Competitor
Nguyen	Thi Phu	Competitor



The Trophy goes to Belgium